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From: Michael E. Mann
To: Edward Cook
Cc: Michael E. Mann; tom crowley; esper@ldeo.columbia.edu; Jonathan Overpeck; Keith Briffa; mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu; p.jones@uea.ac.uk; srutherford@virginia.edu
Subject: Re: hockey stick
Date: Wednesday, May 02, 2001 11:54:24 AM

Hi Ed,

This is fair enough, and I'm sorry if my spelling out my concerns
sounded defensive to you. It wasn't meant to be that way.

Lets figure this
all out based on good, careful
work and see what the data has to say in the end. We're working towards
this ourselves, using revised methods and including borehole data, etc.
and will keep everyone posted on this.

I don't in any way doubt yours and Jan's integrity here.

I'm just a bit concerned that the result is getting used publically, by
some, before it has gone through the gauntlet of peer review.
Especially because it is, whether you condone it or not, being used as
we speak to discredit the work of us, and Phil et al, this is dangerous.
I think there are some legitimate issues that need to be sorted out
with regard to the standardization method, and would like to see
this play out before we jump to conclusions regarding revised estimates
of the northern hemisphere mean temperature record and the nature of
the "MWP".

I'd
be interested to be kept posted on what the status of the manuscript is.

Thanks,

mike

On Wed, 2 May 2001, Edward Cook wrote:

> Hi Mike,
>
> >A few quick points Ed,
> >
> >These "Wally seminars" are self-promoting acts on Broecker's part, and I
> >think the community has to reject them as having any broader significance.
> >If Broecker had pulled this w/ Ray, Malcolm, Keith, Phil, and Tom around,
> >he wouldn't get away w/ such a one-sided treatment of the issue. I've been
> >extremely troubled by what I have heard here.
>
> It appears that you are responding in a way that is a bit overly defensive,
> which I regret. I am not supporting Broecker per se and only explained in a
> very detailed fashion the origin of the work by Esper and me and how it was
> presented to refute a very unfair characterization of tree-ring data in
> Wally's perspective piece. The fact that Esper compared his series with
> Jones, Briffa, and Mann et al. should not be viewed as an attack on your
> work. It was never intended to be so, but it is was a clearly legitimate
> thing to do. As I said, I have no control over Broecker. But it is unfair
> and indeed incorrect to start out by dismissing the "Special Wally

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> Seminars" as self-promoting acts. To say that is simply wrong. He doesn't
> bring people in to only express support for his point of view or pet
> theory, as you are implying. So, I suggest that you cool down a bit on this
> matter. It detracts from the scientific issues that should properly be
> debated here. This is the only point on which I will defend Broecker.
>
> >I'm also a bit troubled by your comparisons w/ glacial advances, etc. and
> >how these correlate w/ your reconstruction. Malcolm, Ray, Phil, and others
> >have been over this stuff time and again, and have pointed out that these
> >data themselves don't support the notion of globally-synchronoous changes.
> >You seem to be arguing otherwise? And with regard to association w/
> >volcanic forcing, Tom has already shown that the major volcanic events are
> >captured correctly in the existing reconstructions, whether or not the
> >longer-term trends are correct or not...
>
> I am not arguing for "globally-synchronous changes" and never have. To
> quote what I said about neo-glacial advances, some of the fluctuations in
> Esper's series "correspond well with known histories of neo-glacial advance
> in some parts of the NH". Note the use of the word "some" in that quote.
> That is a fair statement and why shouldn't I say it if it is true,
> coincidently or not. Whether or not it argues for "globally-synchronous
> changes" is up to you. I would never argue that everything happening on
> multi-decadal time scales is phase-locked across the NH. That would be a
> silly thing to say. But it is perfectly valid to point out the degree to
> which independent evidence for cold periods based on glacier advances
> appears to agree with a larger-scale indicator of temperature variablity. I
> thought this is how science to supposed to proceed. I also don't see your
> point about volcanic forcing. I mentioned this purely in the spirit of the
> work of Crowley and others to suggest that the Esper series is probably
> capturing this kind of signal as well. It has nothing to do with the issue
> of centennial trends in temperature. You are reading far more into what I
> wrote than I ever intended or meant.
>
> >Re the boreholes. Actually, if Tom's estimates are correct, and it is also
> >correct that the boreholes have the low-frequency signal correct over the
> >past few centuries, we are forced to also accept Tom's result that the
> >so-called "MWP", at the hemispheric scale, is actually even COOLER relative
> >to present than our result shows! That was clear in Tom's presentation at
> >the workshop. So lets be clear about that--Tom's work and the boreholes in
> >no way support Broecker's conclusion that the MWP was warmer than we have
> >it--it actually implies the MWP is colder than we have it!
> >Tom, please speak up if I'm not correct in this regard!
>
> I am not saying that Tom's results are wrong. And, I am certainly not
> saying that Broecker is right. I merely described the results of a new
> analysis of a somewhat new set of long tree-ring records from the
> extra-tropics. My statement that the MWP appeared to be comparable to the
> 20th century does not imply, nor was it meant to imply, that somehow the
> 20th century temperature is not truly anomalous and being driven by
> greenhouse gases. To quote from my email, "I would not claim (and nor would
> Jan) that it exceeded the warmth of the late 20th century. We simply do not
> have the precision or the proxy replication to say that yet." Note the use
> of the word "precision". This clearly relates to the issue of error
> variance and confidence intervals, a point that you clearly emphasize in
> describing your series. Also note the emphasis on "late 20th century". I
> think that most researchers in global change research would agree that the
> emergence of a clear greenhouse forcing signal has really only occurred
> since after 1970. I am not debating this point, although I do think that
> there still exists a signficant uncertainty as to the relative
> contributions of natural and greenhouse forcing to warming during the past

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> 20-30 years at least. Note that I also tried to emphasize the
> extra-tropical nature of this series, and it may be that the tropics do not
> show the same strength of warming. But I do argue strongly that we do not
> have the high-resolution proxy data needed to test for a MWP in the
> tropics. Please correct me if I am wrong here.
>
> >We are in the process of incorporating the borehole data into the
> >low-frequency component of the reconstruction. The key difference will be
> >that they are going to be calibrated against the instrumental record and
> >weighted by the spatial coherence within the borehole data rather than what
> >Pollack has done. I expect the results will be different, but in any case
> >quite telling...
>
> Fine.
>
> >I'll let Malcolm and Keith respond to the issues related to the
> >standardization of the Esper chronologies, though it immediately sounds to
> >me quite clear that there is the likelihood of of having contaminated the
> >century-scales w/ non-climatic info. Having now done some work w/
> >chronologies in disturbed forests myself now (in collaboration w/ Dave
> >Stahle), I know how easy it is to get lots of century-scale variability
> >that has nothing to do w/ climate. I imagine the reviewers of the
> >manuscript will have to be convinced that this is the case w/ what Esper
> >has done. I'm very skeptical. I'm also bothered that Broecker has promoted
> >this work prior to any formal peer review. There are some real issues w/
> >the standardization approach and there is a real stretch in promoting this
> >as a hemispheric temperature reconstruction.
>
> I appreciate your skepticism and I hope that Jan and I can convince you
> otherwise. I also encourage you to continue getting your shoulders sore and
> hands dirty on tree-ring sampling and analysis. Esper's analysis is not
> perfect. Nor is anyone elses who works in this game. But if Esper's series
> is wrong on century time scales, then Jones and Briffa are wrong too. If
> Esper's series is also wrong on inter-decadal time scales, then your series
> is wrong as well because on that time scale of variablity, his series
> agrees very well with yours. So, I would be very cautious about declaring
> that Esper's series is in some sense invalid. Finally, as I have said ad
> nausem, I have no control over what Broecker thinks or does beyond
> presenting to him a convincing case for the ability of certain tree-ring
> series to preserve long-term temperature variability. And again, "I also
> tried to emphasize the extra-tropical nature of this series." Please give
> me a break here.
>
> >Finally, what is the exact spatial distribution of the sparse data he used.
> >Scott R. drove home the point regarding the importance of taking into
> >account spatial sampling in his talk at the workshop. A sparse
> >extratratropical set of indicators, no matter how
> >locally-temperature-sensitive they are, will not, unless you're *very*
> >lucky w/ the locations, be an accurate indicator of true N. Hem temp. In
> >general it will overestimate the variance at all timescales. The true N.Hem
> >temperature (ie, weighted largely by tropical ocean SST) has much less
> >variance than extratrpoical continents. There may be a large apples and
> >oranges component to the comparisons you describe.
>
> I know your argument and I am sensitive to it, hence my emphasis on
> "extra-tropical". So, don't look for disagreement on the importance of the
> tropical SSTs to any estimate of NH temperatures. But let's be honest here.
> Your reconstruction prior to roughly AD 1600 is dominated by extra-tropical
> proxies. So, in a way, you are caught in the same dilemma as all other
> people who have tried to do this.

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> >We've shown that are reconstructions in continental extratropical regions
> >have lots more variance and variability. It is, as we have all shown, the
> >averaging over many regions that reduces the amplitude of variability. Our
> >regional reconstructions show far more significant warm and cold periods.
> >But they cancel out spatially!
>
> Understood, but it is still unclear how this all happens as your
> reconstruction proceeds back in time with an increasingly limited and
> spatially-restricted set of proxies. Confidence limits that you place on
> your series is laudable and I agree, to first order, that the MWP in your
> series could easily have been cooler than what you show. But it implicitly
> assumes that the estimates are equally unbiased (or equally biased for that
> matter) back in time. I don't know if that is an issue here, but I believe
> that the issue of bias using an increasingly sparse number of predictors
> scattered irregularly over space has not be investigated. Please correct me
> if I am wrong here.
>
> >If a legitimate argument were to be made that we have significnatly
> >understiamted, within the context of our uncertainty estimates, the
> >amplitude of the MWP at the hemispheric scale, I'd be the first to accept
> >it (note that, as Phil et al pointed out in their recent review article in
> >Science, we do not dispute that temperatures eearly in the millennium,
> >within the uncertainty estimates, may have been comparable to early/mid
> >20th centurys--just not late 20th century temperatures).
>
> We are in agreement here. See my earlier comments.
>
> >Frankly though Ed, I really don't see it here. We may have to let the
> >peer-review process decid this, but I think you might benefit from knowing
> >the consensus of the very able group we have assembled in this email
> >list, on what Esper/you have done?
>
> Of course, I know everyone in this "very able group" and respect their
> opinions and scientific credentials. The same obviously goes for you. That
> is not to say that we can't disagree. Afterall, consensus science can
> impede progress as much as promote understanding.
>
> Cheers,
>
> Ed
>
> >Comments or thoughts?
> >
> >cheers,
> >
> >mike
> >
> >At 10:59 AM 5/2/01 -0400, Edward Cook wrote:
> >> >Ed,
> >> >
> >> >heard some rumor that you are involved in a non-hockey stick reconstruction
> >> >of northern hemisphere temperatures. I am very intrigued to learn about
> >> >this - are these results suggesting the so called Medieval Warm Period may
> >> >be warmer than the early/mid 20th century?
> >> >
> >> >any enlightenment on this would be most appreciated, Tom
> >> >
> >> >
> >> >

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> >> >Thomas J. Crowley
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> >>
> >>Hi Tom,
> >>
> >>As rumors often are, the one you heard is not entirely accurate. So, I will
> >>take some time here to explain for you, Mike, and others exactly what was
> >>done and what the motivation was, in an effort to hopefully avoid any
> >>misunderstanding. I especially want to avoid any suggestion that this work
> >>was being done to specifically counter or refute the "hockey stick".
> >>However, it does suggest (as do other results from your EBM, Peck's work,
> >>the borehole data, and Briffa and Jones large-scale proxy estimates) that
> >>there are unresolved (I think) inconsistencies in the low-frequency aspects
> >>of the hockey stick series compared to other results. So, any comparisons
> >>with the hockey stick were made with that spirit in mind.
> >>
> >>What Jan Esper and I are working on (mostly Jan with me as second author)
> >>is a paper that was in response to Broecker's Science Perspectives piece on
> >>the Medieval Warm Period. Specifically, we took strong exception to his
> >>claim that tree rings are incapable of preserving century time scale
> >>temperature variability. Of course, if Broecker had read the literature, he
> >>would have known that what he claimed was inaccurate. Be that as it may,
> >>Jan had been working on a project, as part of his post-doc here, to look at
> >>large-scale, low-frequency patterns of tree growth and climate in long
> >>tree-ring records provided to him by Fritz Schweingruber. With the addition
> >>of a couple of sites from foxtail pine in California, Jan amassed a
> >>collection of 14 tree-ring sites scattered somewhat uniformly over the
> >>30-70 degree NH latitude band, with most extending back 1000-1200 years.
> >>All of the sites are from temperature-sensitive locations (i.e. high
> >>elevation or high northern latitude. It is, as far as I know, the largest,
> >>longest, and most spatially representative set of such
> >>temperature-sensitive tree-ring data yet put together for the NH
> >>extra-tropics.
> >>
> >>In order to preserve maximum low-frequency variance, Jan used the Regional
> >>Curve Standardization (RCS) method, used previously by Briffa and myself
> >>with great success. Only here, Jan chose to do things in a somewhat radical
> >>fashion. Since the replication at each site was generally insufficient to
> >>produce a robust RCS chronology back to, say, AD 1000, Jan pooled all of
> >>the original measurement series into 2 classes of growth trends: non-linear
> >>(~700 ring-width series) and linear (~500 ring-width series). He than
> >>performed independent RCS on the each of the pooled sets and produced 2 RCS
> >>chronologies with remarkably similar multi-decadal and centennial
> >>low-frequency characteristics. These chronologies are not good at
> >>preserving high-frquency climate information because of the scattering of
> >>sites and the mix of different species, but the low-frequency patterns are
> >>probably reflecting the same long-term changes in temperature. Jan than
> >>averaged the 2 RCS chronologies together to produce a single chronology
> >>extending back to AD 800. It has a very well defined Medieval Warm Period -
> >>Little Ice Age - 20th Century Warming pattern, punctuated by strong decadal
> >>fluctuations of inferred cold that correspond well with known histories of
> >>neo-glacial advance in some parts of the NH. The punctuations also appear,
> >>in some cases, to be related to known major volcanic eruptions.
> >>
> >>Jan originally only wanted to show this NH extra-tropical RCS chronology in

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> >>a form scaled to millimeters of growth to show how forest productivity and
> >>carbon sequestration may be modified by climate variability and change over
> >>relatively long time scales. However, I encouraged him to compare his
> >>series with NH instrumental temperature data and the proxy estimates
> >>produced by Jones, Briffa, and Mann in order bolster the claim that his
> >>unorthodox method of pooling the tree-ring data was producing a record that
> >>was indeed related to temperatures in some sense. This he did by linearly
> >>rescaling his RCS chronology from mm of growth to temperature anomalies. In
> >>so doing, Jan demonstrated that his series, on inter-decadal time scales
> >>only, was well correlated to the annual NH instrumental record. This result
> >>agreed extremely well with those of Jones and Briffa. Of course, some of
> >>the same data were used by them, but probably not more than 40 percent
> >>(Briffa in particular), so the comparison is based on mostly, but not
> >>fully, independent data. The similarity indicated that Jan's approach was
> >>valid for producing a useful reconstruction of multi-decadal temperature
> >>variability (probably weighted towards the warm-season months, but it is
> >>impossible to know by how much) over a larger region of the NH
> >>extra-tropics than that produced before by Jones and Briffa. It also
> >>revealed somewhat more intense cooling in the Little Ice Age that is more
> >>consistent with what the borehole temperatures indicate back to AD 1600.
> >>This result also bolsters the argument for a reasonably large-scale
> >>Medieval Warm Period that may not be as warm as the late 20th century, but
> >>is of much(?) greater significance than that produced previously.
> >>
> >>Of course, Jan also had to compare his record with the hockey stick since
> >>that is the most prominent and oft-cited record of NH temperatures covering
> >>the past 1000 years. The results were consistent with the differences shown
> >>by others, mainly in the century-scale of variability. Again, the Esper
> >>series shows a very strong, even canonical, Medieval Warm Period - Little
> >>Ice Age - 20th Century Warming pattern, which is largely missing from the
> >>hockey stick. Yet the two series agree reasonably well on inter-decadal
> >>timescales, even though they may not be 1:1 expressions of the same
> >>temperature window (i.e. annual vs. warm-season weighted). However, the
> >>tree-ring series used in the hockey stick are warm-season weighted as well,
> >>so the difference between "annual" and "warm-season weighted" is probably
> >>not as large as it might seem, especially before the period of instrumental
> >>data (e.g. pre-1700) in the hockey stick. So, they both share a significant
> >>degree of common interdecal temperature information (and some, but not
> >>much, data), but do not co-vary well on century timescales. Again, this has
> >>all been shown before by others using different temperature
> >>reconstructions, but Jan's result is probably the most comprehensive
> >>expression (I believe) of extra-tropical NH temperatures back to AD 800 on
> >>multi-decadal and century time scales.
> >>
> >>Now back to the Broecker perspectives piece. I felt compelled to refute
> >>Broecker's erroneous claim that tree rings could not preserve long-term
> >>temperature information. So, I organized a "Special Wally Seminar" in which
> >>I introduced the topic to him and the packed audience using Samuel
> >>Johnson's famous "I refute it thus" statement in the form of "Jan Esper and
> >>I refute Broecker thus". Jan than presented, in a very detailed and well
> >>espressed fashion, his story and Broecker became an instant convert. In
> >>other words, Wally now believes that long tree-ring records, when properly
> >>selected and processed, can preserve low-frequency temperature variability
> >>on centennial time scales. Others in the audience came away with the same
> >>understanding, one that we dendrochronologists always knew to be the case.
> >>This was the entire purpose of Jan's work and the presentation of it to
> >>Wally and others. Wally had expressed some doubts about the hockey stick
> >>previously to me and did so again in his perspectives article. So, Jan's
> >>presentation strongly re-enforced Wally's opinion about the hockey stick,
> >>which he has expressed to others including several who attended a

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> >>subsequent NOAA meeting at Lamont. I have no control over what Wally says
> >>and only hope that we can work together to reconcile, in a professional,
> >>friendly manner, the differences between the hockey stick and other proxy
> >>temperature records covering the past 1000 years. This I would like to do.
> >>
> >>I do think that the Medieval Warm Period was a far more significant event
> >>than has been recognized previously, as much because the high-resolution
> >>data to evaluate it had not been available before. That is much less so the
> >>case now. It is even showing up strongly now in long SH tree-ring series.
> >>However, there is still the question of how strong this event was in the
> >>tropics. I maintain that we do not have the proxies to tell us that now.
> >>The tropical ice core data are very difficult to interpret as temperature
> >>proxies (far worse than tree rings for sure and maybe even unrelated to
> >>temperatures in any simple linear sense as is often assumed), so I do not
> >>believe that they can be used alone as records to test for the existence of
> >>a Medieval Warm Period in the tropics. That being the case, there are
> >>really no other high-resolution records from the tropics to use, and the
> >>teleconnections between long extra-tropical proxies and the tropics are, I
> >>believe, far too tenuous and probably unstable to use to sort out this
> >>issue.
> >>
> >>So, at this stage I would argue that the Medieval Warm Period was probably
> >>a global extra-tropical event, at the very least, with warmth that was
> >>persistent and probably comparable to much of what we have experienced in
> >>the 20th century. However, I would not claim (and nor would Jan) that it
> >>exceeded the warmth of the late 20th century. We simply do not have the
> >>precision or the proxy replication to say that yet. This being said, I do
> >>find the dismissal of the Medieval Warm Period as a meaningful global event
> >>to be grossly premature and probably wrong. Kind of like Mark Twain's
> >>commment that accounts of his death were greatly exaggerated. If, as some
> >>people believe, a degree of symmetry in climate exists between the
> >>hemispheres, which would appear to arise from the tropics, then the
> >>existence of a Medieval Warm Period in the extra-tropics of the NH and SH
> >>argues for its existence in the tropics as well. Only time and an enlarged
> >>suite of proxies that extend into the tropics will tell if this is true.
> >>
> >>I hope that what I have written clarifies the rumor and expresses my views
> >>more completely and accurately.
> >>
> >>Cheers,
> >>
> >>Ed
> >>
> >>==========
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From: Michael E. Mann
To: Raymond S. Bradley; mhughes@ltrr.arizona.edu; k.briffa@uea.ac.uk; tom@ocean.tamu.edu; p.jones@uea.ac.uk
Subject: Re: Science letter
Date: Friday, March 02, 2001 9:25:55 AM

Dear All:

Given the feedback, and pressures on my own time, we're dropping it. If someone else wants to take the lead role in drafting something in the future, that is fine with me...

mike

At 10:45 AM 3/2/01 -0500, Raymond S. Bradley wrote:
>i was just about to email you'all re my thoughts on the letter when the
>phone rang--Malcolm, on the road ....expressing his views about the letter
>as it now stands. He will be in touch as soon as he can get to a
>computer. While we were talking Keith's email arrived...so this is all
>very timely!
>My own view is that the letter does not address the key limitations of
>Broecker's argument, namely his minimal and selective use of data to prop
>up a hypothesis. His title should really be "Is there a 1500 year year
>Seesaw in the N. Atlantic" as he does not really provide any new info on
>the MWP. As I said earlier, he does in fact state that the issue of
>whether there was, or was not a MWP remains in doubt. I agree with
>that. I don't think that any of us can definitively rule out the notion
>that temperatures were "warm" (whatever that means) globally in "Medieval
>times" (whenever that was!)...the issue is whether such conditions were
>"warmer" than "today" . If you argue that solar forcing was responsible,
>then we might expect to find more evidence in areas around the world for
>which we don't yet have data. But...this is where I think a longer
>article is needed, and as I said before...you can't capture all that needs
>to be said in a short letter. I agree with Keith that we just muddy the water.
>
>If you want to criticise WB, it should be focused on his "evidence" ---
>one borehole record in Greenland (that shows temps >today), one in
>Antarctica that shows temps <today, and evidence that Swiss glaciers had
>receded around AD1200. He ties this together with his TH circulation
>argument. Not very convincing....but that's his "perspective" i guess.
>
>The bottom line for me is that I would rather not sign on to the current
>letter. If I have time today I will try & write a letter that
>encapsulates my criticism of his article. But the best thing to do is
>just get on with our revised reconstruction-- and make as strong a case as
>we can.
>Ray
>
>
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><http://www.geo.umass.edu/climate/climate.html>
>Paleoclimatology Book Web Site (1999):
>http://www.geo.umass.edu/climate/paleo/html
>
>
>

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From: Keith Briffa
To: mann@multiproxy.evsc.virginia.edu; tom@ocean.tamu.edu
Cc: Phil Jones; mann@virginia.edu; Malcolm Hughes; rbradley@geo.umass.edu; td@gfdl.gov
Subject: Re: Version 1.4
Date: Friday, March 02, 2001 8:12:32 AM
Attachments: letteretal.doc

Hi Mike and Tom and all
Please see the attached thoughts . My silence up to now should not be interpreted as lack of interest - indeed passion- on this topic and the Broecker letter in particular. I don't like his letter but I have agonized over the best course of action. I have read all the comments and feel like the best way forward is not to give him room for melodramatic responses. His letter is confused and serves to muddy rather than clarify the issues, let alone the evidence. By trying to answer all this in a short response you come out being too rigid and end up putting words in his mouth and then attacking them. The issue needs a longer more detailed untangling and discussion. You can't do it here . If a response is merited , it simply needs to hammer home that the Mann et reconstruction (and others) DO INDEED show evidence of Medieval warmth. The problem is that it needs to be better represented in terms of timing, magnitude and detail and simple , poorly resolved and subjectively weighted data (especially when they are complex responders to different seasonal climate parameters) do not clarify the picture at all . Anyway - please take the time to read my thoughts in the accompanying attachment
Very best wishes to all
Keith

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2 March 2001

Mike, Tom *et al.*,

I share your frustration with the handwaving argument and implied criticism contained in Broecker's piece. The general unsubstantiated content, and the selective ignorance (or indifference) to much published work, would normally preclude publication - if, of course, it was not Wally writing it. However, what irks me most is the over-simplification he imposes on this issue, which reads as if forcing must be all from the THC of the Atlantic and not from external causes.

The problem I have with the draft response(s) is that it is falling into a trap of further polarising the issue - i.e. it reads like the opposite of Broecker's premise - that is, it is saying that all of the forcing is external. Sure, there are several factual errors in his piece, but after careful reading again, I urge caution. Why? Well first, nowhere does Broecker actually say that the MWP was warmer than the late 20th century. Second, he is, even by his own admission, speculating as regards the role of THC. This is his prerogative and there is no 'burden of proof' on him at all. You know that I really believe we have problems with the proxies, as regards being sure we are reconstructing the correct level of absolute temperature change. Indeed the data are very scarce and, I believe, more unreliable as regards providing an accurate record of MWP warmth globally than is suggested by Mike's verification statistics (re the *Nature* paper) *per se*. Of course these are genuine doubts, freely exchanged in an intended constructive way within our community. I am clearly on record as stating that the evidence, such as it is, supports the conclusion of unprecedented warmth in the late 20th century. [Indeed I clearly say this and have rewritten this in the imminent piece with Phil and Tim.] Broeker does nothing but muddy the waters by his subjective choice of evidence, loose definitions and implied criticism. But I am simply undecided as to the tone to take in addressing this. The response letter, though very much better than the original drafts, serves to reinforce an over-simplification in the interpretation of the evidence. I simply do not feel qualified to state, with such assurity, that solar and volcanic forcing were "primarily responsible" for 100-1000 year variability. Also remember that our proxies do not reflect the magnitude of late 20th Century warming on a global scale - because we don't have them at this time!

None of this says that I agree with Wally. On the contrary, I think he is guilty of somewhat over-confident preaching here - but it is clearly couched as armwaving and this is his prerogative. Be careful not to put too many words into his mouth. He actually says: that the LIA and subsequent warming are global in extent (fine); several Holocene fluctuations in snow line [of equal scale to modern] occurred in Swiss Alps (maybe - but so what?); various borehole data suggest "the existence of a MWP (true - but only as a relative variation of unknown absolute magnitude); and two multidecadal droughts occurred in the US within his loosely-defined MWP (definite, but again so what?). He concludes we need more Holocene research and hints at importance of underlying variability on modern greenhouse forcing - but fails to see or describe why his evidence is basically useless for addressing this.

I offer the following specific comments on the latest draft:

Broecker says that the Mann reconstruction shows "no hint of MWP" - he is plain wrong - the early (A.D.1000-1200) part does. This is probably the main point to correct.

With regard to the response introduction - the interpretation of his "suggestion" doesn't disagree with the proxies because he never says outright that the MWP was as warm as the present anyway, and the proxies do not cover the late 20th century. Similarly, the proxies used

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don't say anything about forcing. Our just-published JGR paper doesn't extend back 1000 years, so in the list of four references you cite do you mean the paper with the average of three long chronologies (which again clearly support Medieval warmth? If not, best to remove this. The records contained in the early part of the reconstructions (i.e. ≈ 1000 years ago) are still based on very few data - they are certainly not independent and they are potentially subject to larger uncertainty than has been described. The Raper reference refers to only one (small) area in N. Sweden - but the evidence does fit the Alps as well. Note though, that glacier evidence in W. America points to a complicated (different) glacier behaviour, even in the LIA. I can't comment on the modelling work - but don't fall into the old trap (as has Broecker) of selecting regional evidence when it suits. There is room for differing forcings (internal and external) to contribute.

All in all, and after talking with Ray and Phil at length (or despite talking with them) I sympathise with your annoyance but my response would be along different lines to the stress given in this draft on the external forcing. Given this, and my ignorance of the details of Tom D's (and Mike's) modelling experiments, and a lack of time to follow up on Broecker's selected references, I would prefer not to join the list of authors. Please don't misinterpret this - I am still a believer in greenhouse warming and I certainly disagree with the interpretation Broecker puts on the data he chooses to accept- but I will stick with an insistence that the proxy data are not yet sufficient to get too confrontational, especially where the target is more of an implication than a clear attack. I agree with much of what you say, but I feel that the tone of this response will polarise the debate where neither lot of evidence justifies it.
Best wishes,

Keith Briffa

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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu
Cc: raymond s. bradley; srutherford@rwu.edu
Subject: Re: Yang et al 2002
Date: Thursday, March 17, 2005 5:54:18 AM

Malcolm,

Apparently you missed the followup message.

I'm forwarding that. Ray seemed to be satisfied w/ my suggestion...

Message to follow shortly,

mike

At 11:28 PM 3/16/2005, mhughes@ltrr.arizona.edu wrote:

> Hi guys - I vote against including anything just because it has a significant correlation with some climate variable in the 20th century. This is a necessary but far from sufficient condition. Someone who knows a particular kind of proxy can often give very good reasons, related to consistent criteria, for excluding such a record - for example, if the quality of the chronology is unknown or not good enough (e.g. just based on a couple of radiocarbon dates). Or, if no consistent case has been made by the original authors of the record for a climate signal, beyond mere correlation. My understanding was that it was precisely to check such matters that Ray and I have been working through all this stuff. If we're going to include "mystery proxies" solely on the basis of a correlation, he and I and the people working with us have been wasting our time.
> In the case of the Yang et al, we already have good records from the Tibetan plateau from Shao Xuemei (not used by Yang) and Achim Brauening. He (Achim) is
> one of the authors of the Yang et al paper, and, when asked, volunteered the eastern Tibet record we have included. I hope tomorrow to check up on the JApanese tree-ring del C13 record. If it's the one I think, it's worthless as it's based on only a single tree with no good case for a climate signal and no cross-dating.
> Cheers, Malcolm
>
> Quoting "Michael E. Mann" <mann@virginia.edu>:
>
> >
> >
> > HI Ray,
> >
> >
> > Well, one thing that is different here is that we are actually screening
> > all proxies to see if they have a verifiable signal (temperature or
> > precip) against the instrumental record. So we're trying to use an
> > objective measure, rather than just deciding what we think is good or
> > not.
> >
> >
> > I agree we have to eliminate redundant proxies, but for the non-redundant
> > proxies, I vote for letting the screening process decide if we use them
> > or not.

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>
> Now, w/ other issues, I agree w/ Malcolm that we have to apply other
> considerations. For example. the screening process cannot protect us from
> tree-ring series that degrade back in time because of decreasing # of
> contributing chronologies, etc., so here we have to apply an explicit
> quality control (e.g. minimum of 10 samples). If there is reason to
> believe that some of the other proxies may degrade back in time, I agree
> that they should be eliminated where we believe the degradation begins to
> happen.
>
>
> Do you think there are any issues of this sort w/ any of the other
> proxies (including the ones used by Yang et al)?
>
>
> Thanks,
>
>
> Mike
>
>
> At 11:56 AM 3/16/2005, raymond s. bradley wrote:
>
> Mike:
>
> You suggested that we include the Yang et al data set. I don't
> think we should. It is made up of a rag-bag of records (a la
> Crowley) that either already duplicate series that we have, or are
> records that have an unclear relationship to temperature/climate.
>
> Specifically, their composite series is made up of:
>
>
> ice core data from Guliya & Dunde--we
> have
>
> Dulan
> "
> tree-ring indices" and "Tibet" tree ring record [" 12 temperature-sensitive
> tree-ring series from various parts of Tibet"]-we may have some of these?
>
> winter temperature from Eastern China--we have
>
> d13C in wood cellulose in tree9s) from Japan-- I don't know if this means
> anything
>
> d18O in peat cellulose from Jinchuan---- I don't know if this means anything
>
> total organic carbon content (TOC) and the C/N ratio records from Great
Ghost
> Lake and Jiaming Lake in Taiwan----I don't know if this means anything
>
>
> So...I suggest that we do not include these composite series.
>
> I have now sent Scott the Black et al. G. Bulloides series

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From: Michael E. Mann
To: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu
Subject: revisions...
Date: Wednesday, May 19, 2004 6:00:47 PM
Attachments: Supplementary1.doc
Supplementary2.doc
MMNatureResponseRevised.doc

Hi Ray, Malcolm

Revised version of the comment attached. Its a bit long, but I think it hits all the key points now?

I've attached a slight revision of Supplementary Information #1, and I've added a new "Supplementary Information #2" which deals w/ the synthetic PCA experiments. The story isn't quite as clean as I'd like, but it supports our claims.

Meanwhile, I'm going to work on finishing a draft of the replies to the reviewer/MM comments, hopefully will have that to you tomorrow evening, in time for our friday morning discussion...

Mike

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Supplementary Information #1

PCA Analysis of North American ITRDB Data (70 Series available back to 1400)

a. Eigenvalue spectrum for MBH98 PCA analysis (1902-1980 zero reference period, data normalized by detrended 1902-1980 standard deviation):

Rank	Explained Variance	Cumulative Variance
1	0.3818	0.3818
2	0.0976	0.4795
3	0.0491	0.5286
4	0.0354	0.5640

First 2 PCs were retained based on selection rules of MBH98.

b. Eigenvalue spectrum for PCA analysis Based on Convention of MM04 (1400-1971 zero reference period, data unnormalized)

Rank	Explained Variance	Cumulative Variance
1	0.1946	0.1946
2	0.0905	0.2851
3	0.0783	0.3634
4	0.0663	0.4297
5	0.0549	0.4846
6	0.0373	0.5219

5 PCs should be retained in this case using the selection rules of MBH98

However, only the first 2 PCs were retained by MM04, which eliminates the *dominant pattern of low-frequency variability* in the 70 series dataset, which appears as PC#4, rather than PC#1, in this case. This PC is nearly identical to ITRDB PC#1 of MBH98 (Figure 1) and therefore that pattern cannot possibly, as argued by MM04, arise as an artifact of the standardization procedures used by MBH98. The change in choice of reference period, which changes the centering of the data, simply changes the rank, in relative variance explained, of the few leading patterns of variance in the data.

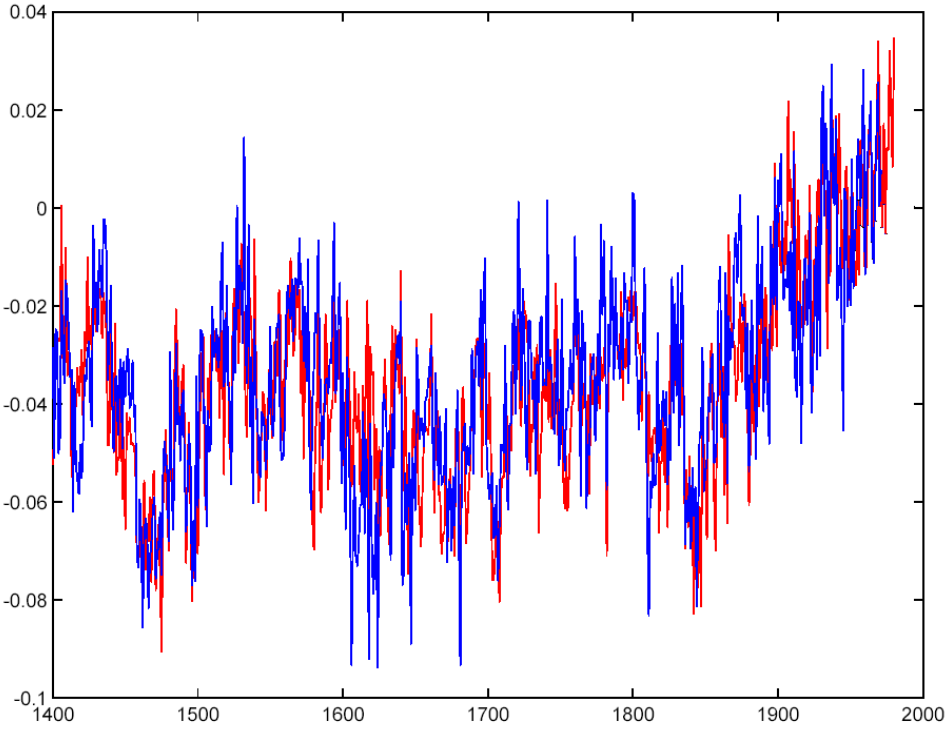

FIGURE 1. Comparison of ITRDB PC #1 from MBH98 (red) and PC #4 resulting from a PCA Analysis using the MM04 centering convention (blue--for visual comparison the blue curve has been adjusted to have the mean and amplitude of the red curve).

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The MBH98 reconstruction was then performed using the MM04 PCA convention to represent the North American ITRDB data, but retaining the first 5 PCs (which follows from the selection protocol of MBH98-see above). A 1902-1971 calibration interval was employed to avoid any missing data, and tthe 'Gaspe' series challenged by MM04 was eliminated. The resulting NH mean reconstruction is broadly consistent with that of MBH98 (Figure 2), though with a somewhat lower verification resolved variance (*RE*=0.22 rather than *RE*=0.51 for MBH98).

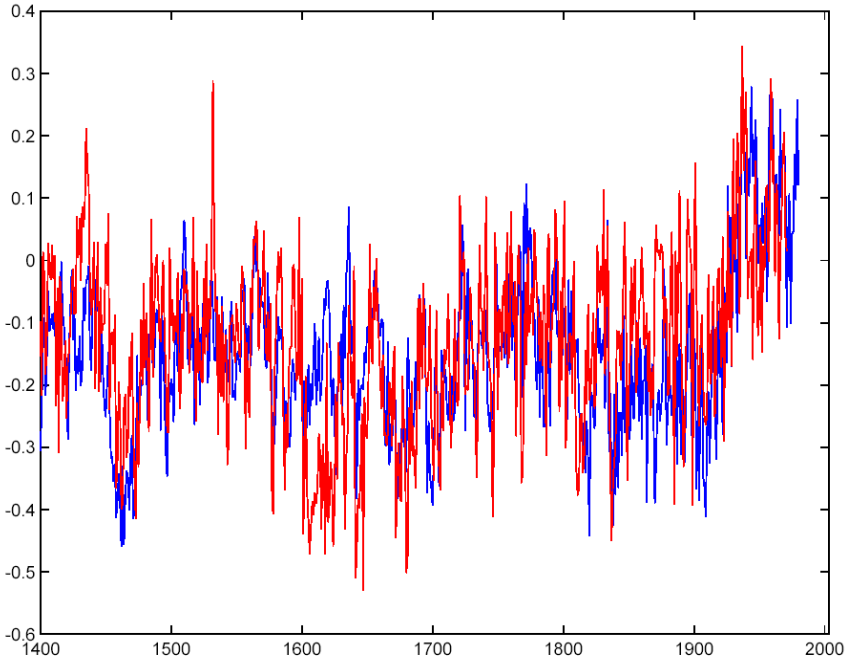

FIGURE 2. Reconstruction retaining first 5 PCs of North American ITRDB data show below, along w/ MBH98. Note that the MBH98 reconstruction show is stepwise, based on increasingly widespread networks of proxy data in subsequent centuries, while the revised reconstruction using the MM04 PCA convention is based on the sparse dataset available back to AD 1400 over the entire interval 1400-1971. The two should thus strictly only be compared over the AD 1400-1500 interval.

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Supplementary Information # 2

We performed the experiments described by MM04 , producing various realizations of M=70 statistically independent red noise series of length N=581 'years', using an N(0,1) Gaussian innovation forcing and the lag one autocorrelation coefficients of each of the actual M=70 North American ITRDB data for the interval 1902-1980.

PCA was calculated based on the un-normalized synthetic data using both a 502-581 zero reference (corresponding to the "1902-1980" centering of MBH98) and a 1-581 zero reference (corresponding to the 1400-1980 centering of MM04).

We performed more than a dozen realizations of this process, and in no case were we able to identify a situation where the 502-581 centering generated a spurious PC pattern that did not exist in the actual data. We did however find cases where such a pattern appeared slightly farther down in the eigenvalue spectrum or as a linear combination of a few other highly ranked PCs. We provide such an example (Figure 1). In this case, the PC#1 series using the two conventions (502-581 vs. 1-581 centered) are, as in the example shown by MM04, completely uncorrelated (annual correlation r=-0.06). However, PC#4 from the 1-581 centered analysis carries much of the signature of the 502-581 PC#1 (annual correlation r=0.65), with a similar 'hockey stick' low-frequency shape. In fact, the 502-581 centered PC#1 is almost completely described as a linear combination of the 1-581 centered PC #4 and PC#2 (the annual correlation with PC#2 is r=-0.45).

We stress, however, that the synthetic red noise example is not an appropriate model for the actual data. Many of the actual 70 tree-ring chronologies in the ITRDB dataset have 20th century trends that are highly significant relative to the null hypothesis of red noise, and there is large-scale structure in the data that belies the null hypothesis of M=70 statistically independent red noise time series. Under such circumstances, the low-frequency patterns of the individual PCs are far more robust with respect to the centering of the data. For example, the PC#1 pattern of the actual North American ITRDB data based on the MBH98 centering convention appears as the nearly identical pattern in the PCA analysis based on the MM04 centering convention, albeit slightly farther down in the eigenvalue spectrum (see Supplementary Information #1).

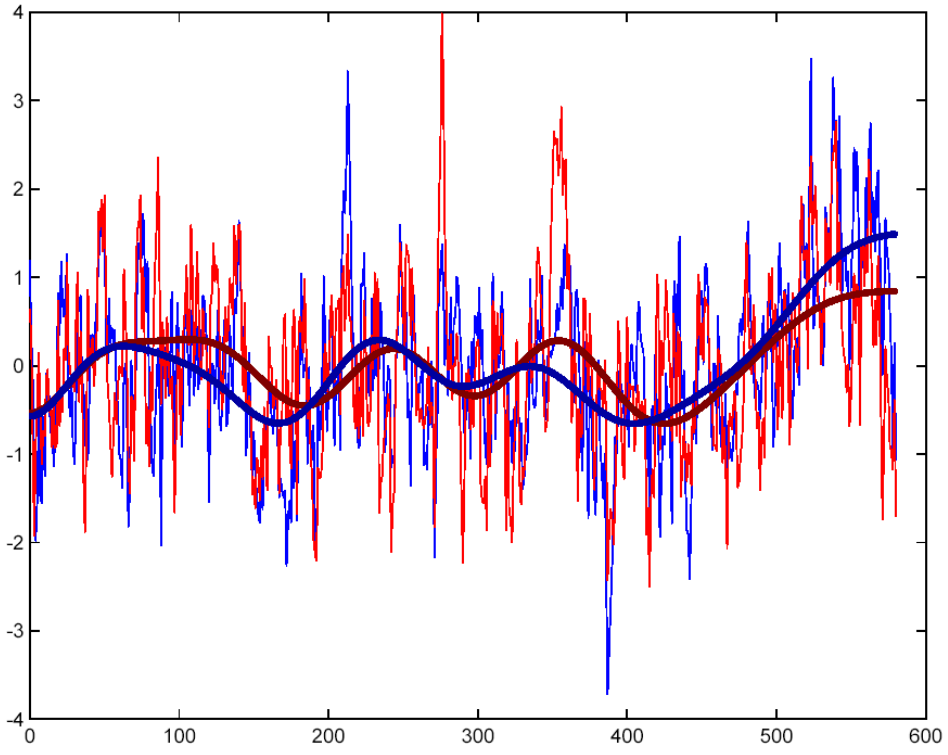

FIGURE 1. Comparison of PC#1 from year 1-581 centered analysis and PC #4 from the year 502-581 centered analysis. Both PCs are standardized to have the same mean and standard deviation, for purposes of comparison. A 100 year smooth of both series is also shown to highlight the low-frequency variations.

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REPLY TO "Global-scale temperature patterns and climate forcings over the past six centuries: A comment." By S. McIntyre and R. McKitrick

Michael E. Mann[1], Raymond S. Bradley[2], Malcolm K. Hughes[3]

[1]*Department of Environmental Sciences, University of Virginia, Clark Hall, Charlottesville, Virginia, 22903, USA*

[2]*Geosciences Department, University of Massachusetts, Amherst, MA 01003, USA*

[3]*Laboratory of Tree Ring Research, University of Virginia, Tucson, AZ 85721, USA*

McIntyre and McKitrick (1) (henceforth 'MM03') claim to have 'corrected' the Mann et al (henceforth 'MBH98') reconstruction (2). They produced their result by eliminating over 70% of the proxy data used by MBH98 prior to AD 1600 (precisely the period during which their result differs significantly from MBH98) to produce a spurious reconstruction that fails statistical verification (3). The authors now ('MM04') falsely claim that the unusual late 20th century warmth of the MBH98 reconstruction is an artifact of (a) the standardization procedure used by MBH98 in calculating principal components (PCs) to represent tree-ring networks and (b) the use of infilled values in one tree-ring series from AD 1400-1403. We demonstrate these claims to be specious.

Their claim that the standardization procedure used on the North American ITRDB data produces the 'hockey stick' pattern of low-frequency variability is false. The choice of centering of the data in PCA simply changes the relative ordering of the leading patterns of variance. Undisclosed by MM04, precisely the same 'hockey stick' PC pattern *appears using their convention*, albeit slightly lower down in the eigenvalue spectrum (PC#4) (Figure 1a).

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Application of the MBH selection criterion (which retained approximately 50% of the variance in the data), selects 2 PCs for the MBH98 centering (1902-1980), but 5 PCs for the MM04 centering (1400-1971). Using the designated 5 PC indictors, rather than, as MM04, incorrectly truncating at two PCs, yields a reconstruction similar to MBH98.

To further underscore the falseness of their claim, we demonstrate similar results whether or not proxy networks are represented in terms of PCs at all. We use the procedure of MBH98 employing all 95 individual proxy indicators of MBH98 available back to AD 1404. Each proxy record was standardized to have unit variance and zero mean over a 1902-1971 calibration period and was given equal weight in the analysis (the 1902-1971 interval avoids a modest number of missing proxy values after 1972, thereby avoiding further discussion of whether this creates a problem). We performed an additional analysis back to AD 1400 eliminating the 'Gaspe' series challenged by MM04. The results of these analyses (Figure 1b), each of which demonstrate statistical skill against independent 19th century instrumental (4) data (*RE*=0.39, 0.33, respectively--only moderately lower than the MBH98 result *RE*=0.51), are virtually indistinguishable and similar to the MBH98 reconstruction. The anomalous early 15th century warmth of MM04 is reproduced only when both the 'Gaspe' series and the entire ITRDB North American data set is censored from the proxy network (Figure 1c). These data were explicitly eliminated by MM03 prior to AD 1600, while MM04 have instead filtered out the leading pattern of low-frequency variability in the data through an inappropriate PCA truncation. Unlike the MBH98 reconstruction, this reconstruction (Figure 1d) clearly fails the standard measure of skill verification (5-7), the 'reduction of error' statistic (*RE*), with *RE=-0.76* (*RE*<0 exhibits no skill, with *RE*=-1 is the average value for a random estimate). While MM04 *accept that their reconstruction fails this essential standard*, they also made an error in their calculation

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of verification scores that underestimating the resolved variance of the MBH98 by almost a factor of two. They also fail to recognize that the R^2 scores they cite in defense of their estimates (which are also incorrect), are widely recognized as inappropriate measures of forecasting or reconstructive skill since they do not account for systematic changes in mean or variance in the prediction (8). As for the potential impact of 'co2 fertilization' on certain high-elevation Western tree-ring chronologies, this is hardly new to us. This was both discussed and dealt with by us in a follow-up to MBH98 (9).

A comparison (Figure 1c) of various published Northern Hemisphere temperature reconstructions (9-14), demonstrates the robustness of the main features of MBH98 to the use of entirely different statistical reconstruction methodologies and proxy datasets. In particular, all reconstructions show anomalous late 20th century warmth and no evidence of MM04's anomalous early 15th century warmth.

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Correspondence and requests for materials should be addressed to M.E.Mann (e-mail: mann@virginia.edu).

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14. Mann, M.E., and P.D. Jones, Global surface temperatures over the past two millennia, *Geophys. Res. Letts.*, *30*, 1820, 10.1029/2003GL017814, 2003.

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Figure 1.

(A) Comparison of leading pattern of low-frequency variability based MBH98 PCA procedure (PC#1--red) and MM04 PCA procedure (PC#5--blue; mean and standard deviation set to that of red curve for comparison).

(B) Comparison of MBH98 reconstruction from AD 1400-1980 (blue) with alternative reconstructions from AD 1400-1971 based on the use of the individual 95 proxy series available back to AD 1403 (yellow), and the 94 proxy series (all 95 series except the 'Gaspe' series discussed in text) available back to AD 1400 (green). Shown for comparison is the instrumental NH annual mean record 1856-1980 (red). The MBH98 reconstruction is based on a 'stepwise' approach employing increasingly more proxy data over time, while the other two reconstructions shown are based on the 'frozen' proxy network available back through the early 15th century.

(C) Comparison of MBH98 reconstruction (blue) from AD 1400-1980 (thick black curve is 40 year smoothed version) with a reconstruction over AD 1400-1600 (yellow) based on the 'censored' network described in the text, arising from the elimination of the 'Gaspe' and North American ITRDB data from the predictor network prior to AD 1600. A suitable approximation to the stepwise MM04 reconstruction is provided by a splice of the yellow curve from AD 1400-1500 with the MBH98 reconstruction (blue) from AD 1500-1971. The resulting series is shown smoothed on a 40 year timescale (thick orange).

Formatted: Indent: Left: 0", Hanging: 0.39", Numbered + Level: 1 + Numbering Style: A, B, C, … + Start at: 1 + Alignment: Left + Aligned at: 0.15" + Tab after: 0.91" + Indent at: 0.91", Tab stops: 0.39", List tab

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(D) Comparison as in (B), but showing the continuation of the reconstruction based on the 'censored' network after AD 1600 (green dashed curve), and the full instrumental Northern Hemisphere temperature record (1856-2003). The failure of the MM04 reconstruction to verify against independent instrumental temperature is evident from the extremely large discrepancy in variance between the yellow and red series during the pre-1902 verification interval.

(E) [Reprinted from Jones and Mann (2004), (C) American Geophysical Union]. Reconstructions of different proxy-based NH estimates (9-14) over the past 1000 years, smoothed on 40 year and longer timescales. Shown also (yellow shading) is the 95% confidence interval for (14). The various other reconstructions have been scaled by linear regression against the smoothed instrumental NH series over the common interval 1856–1980, with the exception of (12), which has been scaled over the shorter 1856–1940 interval owing to a late 20th century decline in temperature response in the underlying data discussed elsewhere (12). Series (10) represents the extension of MBH98 back to AD 1000.

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From: Michael E. Mann
To: Langenberg, Heike
Cc: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; Scott Rutherford; mann@virginia.edu
Subject: RE: MBH98 Data
Date: Monday, December 15, 2003 3:47:05 PM

Hi Heike,

Just to provide some additional further help, so in the main directory of the ftp site, there is a file "MASTER" that gives an overview of the contents of all the various sub-directories.

If you look for example, in the sub-direcotry "PROXY" there is then a "README" file that has detailed information for the contents of that sub-directory. Among other things, that files explains that the file "mbhdatasummary.txt" contains the updated listing of the full network, correcting a few minor errors in the original listing.

You'll note that the files ARGE030, ARGE060, and ARGE065 are not in that listing--they were never included in the network, and the listing of them was a typo. All such typos have been corrected in that listing.

In the "METHODS" sub-directory, there are some additional methodological details, like how the series were normalized, etc.

So, again, we feel that the documentation that we have provided on the website does address each and every issue raised by these people.

If you feel, after looking over the documentation, that it still isn't clear, we would be happy to try to make further changes. We were even going to have a graduate student independently go through the ftp site and make sure that they couldn't find any inconsistencies, etc. So please let us know if you think that would be helpful.

Thanks again for your patience and understanding,

mike

At 09:04 PM 12/15/2003 +0000, Langenberg, Heike wrote:

> Dear Mike,
>
> <?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />
>
> We have downloaded the data from the ftp site that Scott Rutherford kindly supplied to us, and I hope we have all the data on our server now. Thanks for organising that.
>
> I am writing regarding a complaint from Stephen McIntyre and Ross McKitrick (see below) we received, where they describe their attempts to obtain your data and methods and claim not to have been provided with all necessary information to reproduce the results. Could you please provide a point-by-point response to their letter?
>
> I went through the letter, your paper (including Supplementary Information) and the data you supplied to us, and I have a few questions which I list below. Could you please also clarify these issues for me?
>
> 1. There seems to be some confusion over the proxy series used in the reconstruction. In your paper, 112 indicators back to 1820 are mentioned, whereas only 22 indicator go all the way back to 1400. McIntyre and McKitrick refer to 112 proxy series back to 1400, but

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then introduce the number of 159 series, which they say came from you.

I went back to the Supplementary Information for clarification, but I am not sure what counts as an "indicator" - the time series listed or the PC's derived from those time series? Under the assumption that the data sets just listed count as an indicator, and where there is a heading like "9 PCs" these nine PCs replace the listed data sets, I arrive at a number of 117 indicators altogether - neither 112 nor 159.

So could you please send a list of the 112 indicators, and can you comment on McIntyre and McKitrick's claim that you advised them that 159 series should be used?

Also, for example, within the last data set, ITRDB North America, some series go back to 1400, others are shorter. Were still nine PCs for these data used for the longest reconstruction back to 1400 or did you just use the longest time series?

2. In their point 3, McIntyre and McKitrick state that of the 18 time series for South America listed in Supplementary Information, only 11 are used. I note that, for example, ARGE030, ARGE060 and ARGE065, listed in the Supplementary Information, do not seem to be on the ftp site we were pointed to by Scott Rutherford.

Could you please clarify which data sets were used?

3. Regarding McIntyre and McKitrick's point 4, could you please state whether you used annual or summertime temperatures, and if you did indeed truncate the time series (and if yes, why)?

I look forward to receiving your point-by-point responses. I hope you understand that we need to ensure clarity in the data and methods used in this paper. On receiving your responses we will decide how best to proceed (which may involve forwarding your responses to McIntyre and McKitrick). We will keep you updated of the progress.

Best wishes,

Heike

PS I was unable to open the .dat files from the ftp site on my computer. Is there anything I'd need to know about the data format?

****

Letter from Stephen McIntyre and Ross McKitrick:

Dear Sirs,

We have been carrying out a detailed examination of the paper: *Mann, M.E., Bradley, R.S. & Hughes, M.K. (1998) Global-Scale Temperature Patterns and Climate Forcing Over the Past Six Centuries,* Nature, *392, 779-787, 1998* ("MBH98"). We have consulted the Nature on-line Supplementary Information, used two data files sent to us by Professor Mann's group in April 2003 (responding to a request for the FTP location of proxy data used in the above study) and, since Oct. 29, 2003, the

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information at the FTP site ftp://holocene.evsc.virginia.edu/pub/. This site is not identified through nature.com nor was it given to us upon specific request in April 2003, but is now identified by Professor Mann as the actual repository of MBH98 data.

There are a number of points in MBH98 which need substantial clarification, some of which could be resolved with through more adequate Supplementary Information. We have sought such clarification from Professor Mann without success. With reference to the policies stated at http://www nature.com/nature/submit/policies/index.html, in particular item number 6, we are writing to advise you of a persistent refusal to comply with the guidelines and other issues. We draw your attention to the following issues:

1) There is a listing in the Nature Supplementary Information of 112 proxy series said to have been used in MBH98. In April 2003, in response to our request for an FTP site where these data could be found, an associate of Professor Mann (acting on his instructions) sent us a file (pcproxy.txt) containing 112 data series for the entire period back to 1400, together with a file apparently identifying these 112 data series. No FTP site containing these proxy series was identified to us at that time nor in subsequent correspondence with either Professor Mann nor his associate prior to October 29, 2003.

In our analysis, we identified nontrivial problems with the data in the file we had been sent. Professor Mann's associate was unable to shed any light on them. When we sought additional information from Professor Mann, he informed us that demands on his time prevented him from considering this or other inquiries.

We published our findings in *Energy and Environment* 14 (2003). Subsequently, on Oct. 29, 2003, Professor Mann stated that the errors we found in pcproxy.txt were inadvertently introduced into the file at the time it was sent to us, that we failed to consult the correct data at his University of Virginia FTP site and that our study wrongly used 112 proxy series, whereas MBH98 is based on 159 series. Upon inspecting the FTP site on October 29, 2003 (the first we learned of its existence), we identified the identical file we had been sent in April 2003 (pcproxy.txt), together with its Matlab predecessor pcproxy.mat, both dated August 8, 2002, well before our request. Sometime between October 29 and November 8, 2003, both of these files were deleted from Professor Mann's FTP site.

As to the number of proxies, MBH98 clearly refers to only 112 series, as does the on-line Supplementary Information. There is no reference to the use of 159 proxy series. We have requested a listing of these series from Mann. He has responded that the series are located on his FTP site and has refused, despite several requests, to provide more particulars. The difficulty is that the FTP site contains over 430 principal component series commencing in periods after 1400, and the relevant series are not flagged. The FTP site also includes many proxy series seemingly left out of MBH98. This level of disclosure is clearly inadequate. The deletion of archived data files in response to a controversy is also very disquieting. At a minimum, we believe that Nature should archive the 159 series now disclosed to have been used in the MBH98 calculations together with a reconciliation of the difference between the 159 series stated to have been actually used and the 112 series reported in Nature.

2) Some important data relating to MBH98, such as temperature principal components and EOFs, was located at Professor Mann's former University of Massachusetts FTP site. Indeed, Professor Mann's webpage on MBH98 contains no link or reference to the University of Virginia FTP site, but

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does contain links to this University of Massachusetts FTP site. On November 13, 2003, this FTP site was deleted. Important data pertaining to MBH98 formerly located at the University of Massachusetts FTP site is not located at the University of Virginia FTP site.

3) There are numerous discrepancies between the data listing at the Nature SI site and that in the newly-disclosed FTP site at the University of Virginia. Many of the proxy series used in MBH98 are principal components calculated from larger collections of tree ring site "chronologies". The Nature SI site provides listings of the sites reported to have been used in these calculations, with rosters identified for five regions (Oklahoma, US Southwest/Mexico, North America, South America, and Australia) plus a listing of the number of series used for a Vaganov (Russian) collection. We have compared these listings with the information on the sites actually used at the FTP site and found many inconsistencies. For example, in the South American region, only 11 of the 18 sites listed in the Supplementary Information are actually used in MBH98 calculations, according to the evidence of the FTP site. Moreover there is evidence archived at Professor Mann's FTP site of intentional exclusion of a disclosed South American site. An archived email from Hughes to Mann, dated July 29, 1997, and located at ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/VAGANOV/ORIG/malcolm_29-JUL-97 states that exclusion of the site arge030 would be "better for our purposes". This site arge030 can be shown to be Rio Cisne (through the World Data Center for Paleoclimatology) and is listed in the Nature Supplementary Information, but is excluded from the actual data in the FTP site.

4) We found multiple versions at the FTP site of several series, in which a secondary series is a truncated version of the full underlying data. For instance the FTP site contains a correct and complete record of the historical annual Central England Temperature data and historical annual Central Europe Temperature data. Evidence at the site indicates that MBH98 instead used summertime averages from these series, in which the first 70 and 25 years of data, respectively, were intentionally deleted. No explanation is available for this, and the Nature SI site does not indicate or explain this editing of source data.

5) MBH98 states that "conventional" principal components methods were used in the calculation of temperature principal components. The underlying temperature dataset contains endemic missing data; indeed, 4 temperature grid cells from the UK Climate Research Unit selected by MBH98 contain no observations at all. "Conventional" principal components algorithms fail with missing data. Accordingly, MBH98 could not have used conventional methods and a proper description of the methodology actually employed is required. We sought specific clarification on this matter from Professor Mann and were refused. Nor is any available at the FTP site. Disclosure would be trivially easy (simply posting a command file for a statistics package would suffice). Without such information it is effectively impossible for an independent researcher to replicate his calculations.

6) We attempted in our *Energy and Environment* article to assess the impact of the data errors and quality control defects in the proxy data, which we had identified. For the calculation of principal components for the various tree ring regions, we used a standard principal components algorithm (princomp in R), which provides values only for periods in which there are no missing values. In response, MBH98 have stated that they used something called a "stepwise principal components approach", a phrase which is not used in the Nature article or Supplementary Information. Based on their recent comments, this "approach" apparently involves changing the proxy rosters at some points in the PC series, leading to different values of the regional PC depending on the period being analyzed. Whatever the merits of the approach, there is no disclosure of it in MBH98, leaving the reader uninformed about the existence and formulae of a fundamental methodology as well as such basic details as the number and composition of principal components used in each region on a period-by-period bases. We have requested information from Professor Mann allowing us to identify the PC proxy rosters on a period-by-period basis and were refused. He deems it sufficient to merely point to his FTP site, but having examined this site we are unable to uniquely identify the

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"stepwise" PC rosters or the procedures used to splice different series together.

7) MBH98 states that for the temperature data "the mean was removed, and the series was normalized by its standard deviation". This is, therefore, the method we employed. In their reply to our article, MBH criticized us on the grounds that they actually used "de-trended gridpoint standard deviations" to normalize temperature data. Whether the difference is material or not, the fact that their employed methodology contradicts the description in MBH98 means that independent researchers are unable to replicate their work.

8) Prior to the publication of our article, we requested other particulars on the computational methodology from Professor Mann and were refused. Accordingly, we attempted to assess the impact of the data problems by following the methodology publicly disclosed in MBH98. Professor Mann then criticized us for failing to replicate previously undisclosed details of his methodology. We once again requested particulars on his methodology, including copies of the computer programs used to read in the proxy and temperature series and to produce the Northern Hemisphere temperature index-but we have been categorically refused.

The policies of Nature rightly place a burden on authors to disclose data and methods to any interested readers. We have been systematically and deliberately stymied by Professor Mann on the most elementary requests: a proper listing of his data series and the exact computational procedures used. In the process of trying to obtain this information we have concluded that the disclosure at the Nature SI site is not merely inadequate, but in some cases it contradicts what is now revealed at the University of Virginia FTP site.

Under the circumstances, we believe that the full data set and accompanying programs for MBH98 should now be included in the Nature Supplementary Information, along with an accounting of any discrepancies between what has been listed at Nature.com to date and what was actually used in MBH98.

We can make copies of all correspondence and our extensive notes on the data issues available for your inspection if needed. Thank you for your consideration.

Yours truly

Stephen McIntyre

Toronto, Canada

Ross McKitrick

University of Guelph

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Guelph, Canada

****

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http://www.evsc.virginia.edu/faculty/people/mann.shtml

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From: Michael E. Mann
To: Malcolm Hughes; Malcolm Hughes; scott Rutherford; rbradley@geo.umass.edu; fenbiao@ltrr.arizona.edu
Subject: Re: dataset
Date: Thursday, September 04, 2003 3:16:03 PM

---

fair enough Malcolm,

mike

At 03:11 PM 9/4/2003 -0700, Malcolm Hughes wrote:

> Mike - Segment lengths were only one of several criteria, including replication by and until certain dates - for example, when coring for density, it
> is much more likely that one will lose some years at the outside, and so replication falls to unacceptable levels before the end of the series, right in the
> most vital part of the record. Its also rather poor early on in quite a lot of Schweingruber's series, because he visited most of his sites only once, and
> took what he could get, not, at first, being too concerned with replication.I
>
> have done field woork with Fritz, so this comment is based on direct experience. He was, after all, mostly concernd to get the big spatial picture,
> focussing on the interannual - see all his early publicaitons. Correlation between trees is also an important criterion that some of them might have
> failed on. Individual segment lengths can, on occasion, be very short indeed
> in density series because of some details of how the measurements are made,
> so this is not as insignificant as one might think at first sight. So, I think there
> could be some effect even in the high frequency component, especially in the
> late 20th century and the 16th, 17th, and in some regions, even the 18th century. As we want to push the spatial picure back, this could be important.
> So, I think the exercise I proposed would help assess these problems, and
>
> hopefully, rule them out. Cheers, Malcolm
> .
> .Malcolm Hughes
> Professor of Dendrochronology
> Laboratory of Tree-Ring Research
> University of Arizona
> Tucson, AZ 85721
> 520-621-6470
> fax 520-621-8229

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From: Malcolm Hughes
To: scott Rutherford; mann@virginia.edu; rbradley@geo.umass.edu; fenbiao@ltrr.arizona.edu
Subject: dataset
Date: Thursday, September 04, 2003 10:48:35 AM

Gentlemen - I have been mulling over the structure of the tree-ring part of the dataset, as we settled on it a week or two back, and wonder if a variant might also be tried. Briefly, the present set will consist of those culled from the ITRDB (excluding the Schweingruber contributions) and by our direct approaches to authors, all of which have to meet certain a priori standards, plus two versions of the Schweingruber density data chosen to represent low frequency and high frequency respectively. I like this arrnagement because, although different standards were used by Keith, at least those two datasets are well documented.
On the other hand, many of the Schweingruber chronologies do not meet the standards we have applied to the other tree-ring data - usually because of short segment lengths and poor replication in some cases. This could give rise to criticism (not unjustified). SO, if it were not too big a hassle, I propose the following procedure when the reconstruction process starts:
a)Use the tree ring data as described at the beginning of this message, along with all the corals, ice cores,. etc.
b) Compare this with runs done using the Schweingruber chronologies that did pass our standards (about 130 series I think) ans were excluded from the ITRDB set we sent to Scott, instead of the Briffa datasets.
All being well the results will be rather similar and we can continue with option a, else....?
What do you think?
Cheers, Malcolm
.
.

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From: Raymond S. Bradley
To: mann@multiproxy.evsc.virginia.edu; srutherford@virginia.edu; mhughes@ltrr.arizona.edu
Subject: Fwd: Paleo Data
Date: Friday, March 07, 2003 9:29:56 AM
Attachments: paleodata-catalogue11.xls

I attach a spread sheet summarizing the paleo-data sets currently held here. I have not attempted any kind of "quality control" in this inventory--clearly some of these records are suspect (at best) and maybe just rubbish (e.g. some of Lamb's early anecdotal compilations). There is also a fair amount of duplication (or shingling) in certain sets (eg the different Agassiz ice core records based on varying sets of core combinations...). Nevertheless, this gets us to the point where we can start to fill in additional gaps. No doubt many of the tree-ring series listed here are duplicated in the ITRDB or in Malcolm's holdings.
we also have digitized some long low frequency types of data --glacier positions, for example, but these are no included here.
Comments welcome...
Ray
PS I'll be at the Aston hotel in Nice, april 6-11. Given the Bush stance, better bring a gas mask...

>Date: Thu, 06 Mar 2003 11:59:16 -0500
>From: Frank Keimig <frank@geo.umass.edu>
>User-Agent: Mozilla/5.0 (Windows; U; Win98; en-US; rv:1.0.2)
>Gecko/20021120 Netscape/7.01
>X-Accept-Language: en-us, en
>To: "Raymond S. Bradley" <rbradley@geo.umass.edu>
>Subject: Paleo Data
>
>Ray,
>
>Attached is the up to date paleo data catalog. I have a few files I need
>to identify:
>elephant.dat
>hankou.win
>riaotemp.sum
>santpcp.win
>shanghai.win
>Any of these look familiar?
>
>Also, is any of the "grapes" data I inherited when I got here of any use?
>
>Frank
>
>--
>Frank Keimig
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Raymond S. Bradley

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Description	Type	Resolution	File	Dates	Location	Notes
Cebu Island, Philippines coral $\delta^{18}O$	CI	ANN	cebu.o18	1859-1980	vortex c:\frank\climate1\paleo\paleo.zip	From Patzold
Galapagos coral $\delta^{18}O$	CI	ANN	galapago.2	1607-1981	vortex c:\frank\climate5\corals\allfiles.zip	From Rob Dunbar
Great Barrier Reef coral calcification	CO	ANN	jlough	1615-1982	vortex c:\frank\climate1\paleo\paleo.zip	From J. Lough
Wetness/dryness index at 120 stations in China	HO	ANN	china.wet	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	1 value for each station (stations found in china.stn)*
Beijing reconstructed April to August temperatures	HO	ANN	beijsum.dat	1724-1986	vortex c:\frank\climate5\histser\allfiles.zip	5 monthly values per year*
East China decadal dust rain frequency	HO	DEC	zhandust.frq	1400-1930	vortex c:\frank\climate5\histser\allfiles.zip	# years with notable dust fall at various locations*
East China reconstructed winter temperature anomalies	HO	DEC	wangechi.win	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
East China reconstructed spring temperature anomalies	HO	DEC	wangechi.spr	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
East China reconstructed summer temperature anomalies	HO	DEC	wangechi.sum	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
East China reconstructed fall temperature anomalies	HO	DEC	wangechi.fal	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
East China reconstructed annual temperature anomalies	HO	DEC	wangechi.ann	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
North China reconstructed winter temperature anomalies	HO	DEC	wangnchi.win	1380-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
North China reconstructed spring temperature anomalies	HO	DEC	wangnchi.spr	1380-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
North China reconstructed summer temperature anomalies	HO	DEC	wangnchi.sum	1380-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
North China reconstructed fall temperature anomalies	HO	DEC	wangnchi.fal	1380-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
North China reconstructed annual temperature anomalies	HO	DEC	wangnchi.ann	1380-1979	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1880-1979*
China winter thunder frequency	HO	30Y	wangthun.win	1160-1880	vortex c:\frank\climate5\histser\allfiles.zip	Nov, Dec, Jan*
China regional winter temperature indices	HO	DEC	zhang.rg1	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Eastern part of Chiangjiang Basin*
China regional winter temperature indices	HO	DEC	zhang.rg2	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Central part of Chiangjiang Basin*
China regional winter temperature indices	HO	DEC	zhang.rg3	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Hunan and Jangxi provinces*
China regional winter temperature indices	HO	DEC	zhang.rg4	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Southeastern provinces*
China regional winter temperature indices	HO	DEC	zhang.rg5	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Guangdong and Guangxi provinces*
Shandong Province, China cold winter index	HO	DEC	wuyin.win	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
S.E. China reconstructed winter temperature anomalies	HO	DEC	wngwngfr.win	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	24-35N, E of 112E*
S.E. China reconstructed spring temperature anomalies	HO	DEC	wngwngfr.spr	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	24-35N, E of 112E*
S.E. China reconstructed summer temperature anomalies	HO	DEC	wngwngfr.sum	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	24-35N, E of 112E*
S.E. China reconstructed fall temperature anomalies	HO	DEC	wngwngfr.fal	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	24-35N, E of 112E*
S.E. China reconstructed annual temperature anomalies	HO	DEC	wngwngfr.ann	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	24-35N, E of 112E*
Shanghai, China reconstructed winter temperature anomali	HO	DEC	wangwang.win	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	Based on freezing index and modified snowfall index*
Haihe Basin China frequency of cold winters	HO	DEC	wuyinc.win	1500-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Haihe Basin China frequency of warm winters	HO	DEC	wuyinw.win	1500-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Eastern China number of cold winters	HO	DEC	zhangong.win	1500-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Lower Yellow R., China summer temperature anomalies	HO	DEC	wngwng1.sum	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	35N,110E;35N,120E;41N,120E;41N,110E*
Lower Yangtze R., China summer temperature anomalies	HO	DEC	wngwng2.sum	1470-1979	vortex c:\frank\climate5\histser\allfiles.zip	25N,110E;25N,120E;35N,120E;35N,110E*
Lower Yellow R., China number of frosts	HO	DEC	zhangong.frs	1440-1949	vortex c:\frank\climate5\histser\allfiles.zip	*
Mid and lower Changjiang R., China winter temp index	HO	30Y	zhenfeng.win	1471-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Moose Factory, Canada date of first breaking of ice	HO	ANN	moosefac.ice	1736-1871	vortex c:\frank\climate5\histser\allfiles.zip	On Moose River - julian day - ~51N, ~81W*
Fort Albany, Canada date of first breaking of ice	HO	ANN	ftalbany.ice	1722-1866	vortex c:\frank\climate5\histser\allfiles.zip	On Albany River - julian day - ~52N, ~82W*
Greenland west coast greatest extent drift ice	HO	ANN	arcdrift.ice	1821-1939	vortex c:\frank\climate5\histser\allfiles.zip	See paper file*
Santiago District, Chile winter rainfall index	HO	ANN	chilrain.dat	1535-1973	vortex c:\frank\climate5\histser\allfiles.zip	Digitized from Lamb -see paper file*
England July/August wetness/dryness index	HO	DEC	lambeng.sum	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~0E - digitized from Lamb -see paper file*
England DJF mildness/severity index	HO	DEC	lambeng.sum	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~0E - digitized from Lamb -see paper file*

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Bohemia, Czechoslovakia winter temperature index	HO	DEC	bohtemp.win	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely warm & extremely cold seasons*
Bohemia, Czechoslovakia spring temperature index	HO	DEC	bohtemp.spr	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely warm & extremely cold seasons*
Bohemia, Czechoslovakia summer temperature index	HO	DEC	bohtemp.sum	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely warm & extremely cold seasons*
Bohemia, Czechoslovakia fall temperature index	HO	DEC	bohtemp.fal	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely warm & extremely cold seasons*
Bohemia, Czechoslovakia winter precipitation index	HO	DEC	bohprec.win	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely wet & extremely dry seasons*
Bohemia, Czechoslovakia spring precipitation index	HO	DEC	bohprec.spr	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely wet & extremely dry seasons*
Bohemia, Czechoslovakia summer precipitation index	HO	DEC	bohprec.sum	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely wet & extremely dry seasons*
Bohemia, Czechoslovakia fall precipitation index	HO	DEC	bohprec.fal	1501-1900	vortex c:\frank\climate5\histser\allfiles.zip	Difference in # extremely wet & extremely dry seasons*
Germany DJF mildness/severity index	HO	DEC	lambger.win	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~12E - digitized from Lamb -see paper file*
Germany July/August wetness/dryness index	HO	DEC	lambger.sum	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~12E - digitized from Lamb -see paper file*
Russia DJF mildness/severity index	HO	DEC	lambrus.win	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~35E - digitized from Lamb -see paper file*
Russia July/August wetness/dryness index	HO	DEC	lambrus.sum	1100-1969	vortex c:\frank\climate5\histser\allfiles.zip	~50N, ~35E - digitized from Lamb -see paper file*
Central Russia winter temperature	HO	30Y	boriswin.dat	1500-1980	vortex c:\frank\climate5\histser\allfiles.zip	47N-65N, 25E-50E*
Central Russia spring temperature	HO	30Y	borisspr.dat	1500-1980	vortex c:\frank\climate5\histser\allfiles.zip	47N-65N, 25E-50E*
Central Russia summer temperature	HO	30Y	borissum.dat	1500-1980	vortex c:\frank\climate5\histser\allfiles.zip	47N-65N, 25E-50E*
Central Russia fall temperature	HO	30Y	borisfal.dat	1500-1980	vortex c:\frank\climate5\histser\allfiles.zip	47N-65N, 25E-50E*
Oresund (Danish Sound), Denmark # days with ice	HO	ANN	oresund.ice	1763-1926	vortex c:\frank\climate5\histser\allfiles.zip	Digitized from Lamb -see paper file*
Baltic Sea greatest area attained by ice	HO	ANN	baltic.ice	1720-1957	vortex c:\frank\climate5\histser\allfiles.zip	1000s of sq km*
Riga, Latvia julian date of final opening of port	HO	ANN	rigaopen.dat	1530-1958	vortex c:\frank\climate5\histser\allfiles.zip	Digitized from Lamb -see paper file - not continuous before 1710*
China - geographic characteristics of droughts and floods	HO	ANN	chidrout.fld	950-1984	vortex c:\frank\climate5\histser\allfiles.zip	See paper file*
Japan degree of storm damage	HO	ANN	japanstm.dmg	1650-1982	vortex c:\frank\climate5\histser\allfiles.zip	Geometric mean of yearly loss of life and residential buildings*
Hirosaki, Japan est. value of winter temperature deviation	HO	O	maejtagt.win	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of spring temperature deviation	HO	O	maejtagt.spr	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of summer temperature deviation	HO	O	maejtagt.sum	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of fall temperature deviation	HO	O	maejtagt.fal	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of annual temperature deviation	HO	O	maejtagt.ann	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of winter precip deviation	HO	O	maejtagp.win	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of spring precip deviation	HO	O	maejtagp.spr	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of summer precip deviation	HO	O	maejtagp.sum	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of fall precip deviation	HO	O	maejtagp.fal	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Hirosaki, Japan est. value of annual precip deviation	HO	O	maejtagp.ann	1661-1870	vortex c:\frank\climate5\histser\allfiles.zip	From 1661-1868 mean - 20 to 40 year intervals*
Honshu, Japan winter weather type indices	HO	DEC	maejtagi.win	600-1900	vortex c:\frank\climate5\histser\allfiles.zip	51 year weighted running mean*
Honshu, Japan summer weather type indices	HO	DEC	maejtagi.sum	600-1900	vortex c:\frank\climate5\histser\allfiles.zip	51 year weighted running mean*
Seoul, Korea # April-June drought months	HO	DEC	korea.drt	1010-1969	vortex c:\frank\climate5\histser\allfiles.zip	Combination of historical and instrumental*
Korea indices of warm winter weather states	HO	DEC	koreawrm.win	1010-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Korea indices of cold winter weather states	HO	DEC	koreacld.win	1010-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Korea indices of warm weather states during spr, sum, fal	HO	DEC	koreawrm.ssf	1010-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
Korea indices of cold weather states during spr, sum, fal	HO	DEC	koreacld.ssf	1010-1979	vortex c:\frank\climate5\histser\allfiles.zip	*
South Korea frequency of dry and extremely dry events	HO	50Y	korea.dry	1392-1900	vortex c:\frank\climate5\histser\allfiles.zip	*
South Korea frequency of abnormal great rainfall events	HO	50Y	korea.wet	1392-1900	vortex c:\frank\climate5\histser\allfiles.zip	*
Ayuthya, Thailand flood levels	HO	ANN	thaifld.ann	1831-1959	vortex c:\frank\climate5\histser\allfiles.zip	For Chao Phya River*
Indian O.,Indonesia,W. Cent. Pac. O SST anomalies	HO	ANN	wang.sst	1470-1989	vortex c:\frank\climate5\histser\allfiles.zip	From 1880-1979 - 0N,180W; 0N,90W; 10S,90W; 10S,180W*
NAO reconstruction (Luterbacher)	HO	MON	naomlyrecon.txt	1659-1995	vortex c:\frank\paleo	Based on principal components regression analysis

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NAO reconstruction (Luterbacher)	HO	SEA	naoseasrecon.txt	1500-1658	vortex c:\frank\paleo	Based on principal components regression analysis
Indices of summer sea ice severity in Hudson Strait	HO	ANN	ch1.dat	1751-1889	vortex c:\frank\climate5\histser\allfiles.zip	From Climate Since A.D. 1500 - Chapter 2
Indices of summer ice severity in western Hudson Bayt	HO	ANN	ch1.dat	1751-1869	vortex c:\frank\climate5\histser\allfiles.zip	From Climate Since A.D. 1500 - Chapter 2
Indices of summer ice severity in eastern Hudson Bayt	HO	ANN	ch1.dat	1751-1870	vortex c:\frank\climate5\histser\allfiles.zip	From Climate Since A.D. 1500 - Chapter 2
Recon May/Jun Temp Anom east coast Hud./James Bay	HO	ANN	ch1.dat	1800-1899	vortex c:\frank\climate5\histser\allfiles.zip	From Climate Since A.D. 1500 - Chapter 2
Central Europe temperature and precipitation indices	HO	MLY	ch6.dat	1525-1979	vortex c:\frank\climate5\histser\allfiles.zip	From Pfister-see Climate Since A.D. 1500, Chap 6 & pfist89.dat below
Beijing May/June/July rain days and rain hours	HO	ANN	ch11.dat	1724-1903	vortex c:\frank\climate5\histser\allfiles.zip	From W.C. Wang et al. - see Climate Since A.D. 1500, Chapter 11
Honshu, Japan index of summer weather type frequencies	HO	DEC	maejsum.csv	600-1900	vortex c:\frank\climate5\histser\allfiles.zip	From Maejima and Tagami
Honshu, Japan index of winter weather type frequencies	HO	DEC	maejwin.csv	600-1900	vortex c:\frank\climate5\histser\allfiles.zip	From Maejima and Tagami
Central Europe temperature indices	HO	MLY	pfist89.dat	1525-1989	vortex c:\frank\climate5\histser\allfiles.zip	From C. Pfister - see ch6.dat and readme.pfi in allfiles.zip
South China - 3 regions - number cold winters	HO	DEC	wng16rg6.win (also rg7,rg8)	1510-1960	vortex c:\frank\climate5\histser\allfiles.zip	From Wang et al.
Milcent, Greenland ice core accumulation	IA	ANN	l73mc.mil	1176-1967	vortex c:\frank\climate5\histser\fisher\allfiles	1973 core*
Crete, Greenland ice core accumulation	IA	ANN	l74-12.crt	553-1974	vortex c:\frank\climate5\histser\fisher\allfiles	1974 core*
Mt. Logan net accumulation	IA	ANN	ch25.dat	1721-1987	vortex c:\frank\climate5\histser\allfiles.zip	From Holdsworth - see Climate Since A.D. 1500, Chap 25
Lomonosovfonna, Svalbard accumulation	IA	ANN	ch26.dat	1657-1973	vortex c:\frank\climate5\histser\allfiles.zip	From Tarussov - see Climate Since A.D. 1500, Chap 26
Milcent, Greenland accumulation	IA	ANN	ch26.dat	1657-1973	vortex c:\frank\climate5\histser\allfiles.zip	From Tarussov - see Climate Since A.D. 1500, Chap 26
Agassiz/Crete/Milcent normalized average accumulation	IA	ANN	acmnorm3.crt	1622-1983	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap accumulation	IA	ANN	lamdg-1y.p89	1883-1988	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
E. Central Greenland normalized accumulation	IA	ANN	lnorme2.crt	1677-1983	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Central west Greenland super stack $\delta^{18}O$	II	ANN	delnorm6.cwg	553-1982	vortex c:\frank\climate1\paleo\paleo.zip	From D. Fisher - see file fisher1 in paleo.zip
Penny 2 core $\delta^{18}O$	II	ANN	bld1yr.p95	1718-1992	vortex c:\frank\climate1\paleo\paleo.zip	From D. Fisher
Agassiz Ice Cap $\delta^{18}O$	II	ANN	mg79s1y.a79	973-1972	vortex c:\frank\climate5\histser\fisher\reform	1979 core*
Agassiz Ice Cap $\delta^{18}O$	II	ANN	mg84s1y.a84	1217-1973	vortex c:\frank\climate5\histser\fisher\allfiles	1984 core*
Agassiz Ice Cap $\delta^{18}O$	II	ANN	mg87s1yr.a87	1313-1961	vortex c:\frank\climate5\histser\fisher\allfiles	1987 core*
Agassiz Ice Cap $\delta^{18}O$	II	ANN	mer77s1y.a77	1349-1977	vortex c:\frank\climate5\histser\fisher\allfiles	1977 core*
Devon Island Ice Cap $\delta^{18}O$	II	ANN	bld-1.dev	1512-1973	vortex c:\frank\climate5\histser\fisher\allfiles	1972+1973 cores*
Agassiz Ice Cap $\delta^{18}O$	II	5Y	mg84s5y2.a84	42 BC-1973	vortex c:\frank\climate5\histser\fisher\allfiles	1984 core*
Agassiz Ice Cap $\delta^{18}O$	II	5Y	mg87s5yr.a87	304 BC-1961	vortex c:\frank\climate5\histser\fisher\allfiles	1987 core*
Agassiz Ice Cap $\delta^{18}O$	II	5Y	mer77s5y.a77	518 BC-1977	vortex c:\frank\climate5\histser\fisher\allfiles	1977 core*
Devon Island Ice Cap $\delta^{18}O$	II	5Y	bld-5.dev	727 BC-1973	vortex c:\frank\climate5\histser\fisher\allfiles	1972+1973 cores*
Greenland $\delta^{18}O$	II	ANN	mayewski.o18	1868-1984	vortex c:\frank\climate5\histser\allfiles.zip	65.01N, 44.87W*
Camp Century, Greenland $\delta^{18}O$	II	5Y	cc-5ynew.ccc	1217-1972	vortex c:\frank\climate5\histser\fisher\allfiles	*
Milcent, Greenland $\delta^{18}O$	II	ANN	mc73-1y.mil	1176-1967	vortex c:\frank\climate5\histser\fisher\allfiles	1973 core*
Camp Century, Greenland $\delta^{18}O$	II	ANN	cc-1y.ccc	1176-1967	vortex c:\frank\climate5\histser\fisher\allfiles	*
Milcent, Greenland $\delta^{18}O$	II	O	mc73-8.mil	1177-1967	vortex c:\frank\climate5\histser\fisher\allfiles	1973 core - 8 values/year*
Crete, Greenland $\delta^{18}O$	II	O	ct74-12.crt	554-1974	vortex c:\frank\climate5\histser\fisher\allfiles	1974 core - 12 values/yr*
North Grip $\delta^{18}O$	II	20Y	northgrip.txt	10064 BC-1996	vortex c:\frank\paleo\data	
Quelccaya $\delta^{18}O$	II	ANN	queld018.new	1481-1984	vortex c:\frank\climate5\histser\allfiles.zip	
Mt. Logan core $\delta^{18}O$	II	ANN	ch25.dat	1736-1987	vortex c:\frank\climate5\histser\allfiles.zip	From Holdsworth - see Climate Since A.D. 1500, Chap 25

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Dunde, China $\delta^{18}O$	II	ANN	d1strat.tim	1606-1987	vortex c:\frank\climate5\histser\allfiles.zip	From L. Thompson
Dunde, China $\delta^{18}O$	II	DEC	d1oxtim.ave	last 1500 yrs	vortex c:\frank\climate5\histser\allfiles.zip	From L. Thompson
Vostok deuterium content/temperature	II	VAR	deutnat.txt	last ~423,000 years	vortex c:\frank\ray\nature1.zip	From Petit et al., 1999, Nature - see readme1.doc in same zip file
Dasuopu $\delta^{18}O$	II	ANN	dasuopu.o18	1950-1997	vortex c:\frank\sajdel18o\allfiles.zip	3 cores - annual averages
Agassiz Ice Cap $\delta^{18}O$	II	25Y	a8487s25.a84	9064BC-1961	vortex c:\frank\climate5\histser\fisher\allfiles	2 core average
Agassiz Ice Cap $\delta^{18}O$ - scoured minus unscoured	II	ANN	a84-bld.1yr	1888-1973	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap $\delta^{18}O$ - blended	II	ANN	bldmer77.1yr	1892-1977	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Crete, Greenland $\delta^{18}O$	II	ANN	ct74-1y.crt	553-1974	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap Denis Greg pit $\delta^{18}O$	II	ANN	deldg-1y.p89	1883-1988	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Crete, Greenland normalized averaged $\delta^{18}O$	II	ANN	delnorm3.crt	1622-1983	vortex c:\frank\climate5\histser\fisher\allfiles	3 cores
Crete, Greenland normalized averaged $\delta^{18}O$	II	ANN	delnorm4.crt	1622-1983	vortex c:\frank\climate5\histser\fisher\allfiles	4 cores
Camp Century, Greenland normalized stacked $\delta^{18}O$	II	ANN	delnort3.stk	1761-1972	vortex c:\frank\climate5\histser\fisher\allfiles	3 cores
Crete, Greenland? normalized averaged $\delta^{18}O$	II	ANN	dnorme2.crt	1777-1983	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Milcent, Greenland $\delta^{18}O$	II	8/YR	mc73-8.mil	1176-1967	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg77norm.1yr	1349-1977	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg79norm.1yr	1173-1972	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg848779.1yr	1300-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg8487nm.1yr	1340-1971	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg84norm.1yr	1217-1973	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mg87norm.1yb	1304-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap $\delta^{18}O$	II	ANN	mg87s1yb.a87	1304-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	mgnorm.1yr	1340-1971	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized $\delta^{18}O$	II	ANN	norm7789.1yr	1892-1977	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap % melt	IM	ANN	pc84-1y2.a84	1242-1961	vortex c:\frank\climate5\histser\fisher\reform	1984 core*
Agassiz Ice Cap % melt	IM	ANN	pc87-1yr.a87	1231-1961	vortex c:\frank\climate5\histser\fisher\reform	1987 core*
Agassiz Ice Cap % melt	IM	5Y	pca77vol.a77	466-1966	vortex c:\frank\climate5\histser\fisher\reform	1977 core*
Devon Island Ice Cap % melt	IM	5Y	melt.dev	1335-1960	vortex c:\frank\climate5\histser\fisher\allfiles	1973 core*
Devon Island Ice Cap % melt	IM	5Y	pc5bld.dev	1161-1971	vortex c:\frank\climate5\histser\fisher\reform	1971+1972+1973 cores*
Agassiz Ice Cap % melt	IM	5Y	pc87-5yr.a87	51-1961	vortex c:\frank\climate5\histser\fisher\reform	1987 core*
Agassiz Ice Cap % melt	IM	5Y	pc84-5y2.a84	9 BC-1961	vortex c:\frank\climate5\histser\fisher\reform	1984 core*
Austfonna, Svalbard melt percentage	IM	ANN	ch26.dat	575BC-1987	vortex c:\frank\climate5\histser\allfiles.zip	From Tarussov - see Climate Since A.D. 1500, Chap 26
South Greenland reconstructed summer temperature	IM	ANN	kameda.dat	1545-1988	vortex c:\frank\climate5\histser\allfiles.zip	From T. Kameda
Lomonosov, Svalbard Ice Cap summer melt	IM	ANN	tarussov.dat	1400-1985	vortex c:\frank\climate5\histser\allfiles.zip	From Tarussov
Agassiz Ice Cap normalized % melt	IM	5Y	norm8477.5pc	462-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized % melt	IM	5Y	pc778487.5yr	1802-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap normalized % melt	IM	5Y	pc7787.5yr	1802-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap % melt	IM	ANN	pc79-1y.a79	613-1971	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap % melt	IM	5Y	pca79-5y.a79	617-1971?	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Agassiz Ice Cap % melt	IM	50Y	pcavhol3.a84	8388BC-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	

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Agassiz Ice Cap normalized averaged % melt	IM	5Y	pcnorm-5.all	617-1961	vortex c:\frank\climate5\histser\fisher\allfiles.zip	
Salem, MA reconstructed winter temperature	IN	ANN	holytem.win	1754-1828	vortex c:\frank\climate5\histser\allfiles.zip	*
Salem, MA reconstructed spring temperature	IN	ANN	holytem.spr	1754-1828	vortex c:\frank\climate5\histser\allfiles.zip	*
Salem, MA reconstructed summer temperature	IN	ANN	holytem.sum	1754-1828	vortex c:\frank\climate5\histser\allfiles.zip	*
Salem, MA reconstructed fall temperature	IN	ANN	holytem.fal	1754-1828	vortex c:\frank\climate5\histser\allfiles.zip	*
Salem, MA reconstructed annual temperature	IN	ANN	holytem.ann	1754-1828	vortex c:\frank\climate5\histser\allfiles.zip	*
Eastern U.S. reconstructed winter precipitation	IN	ANN	eastuspr.win	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	mm - digitized from Lamb*
Eastern U.S. reconstructed spring precipitation	IN	ANN	eastuspr.spr	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	mm - digitized from Lamb*
Eastern U.S. reconstructed summer precipitation	IN	ANN	eastuspr.sum	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	mm - digitized from Lamb*
Eastern U.S. reconstructed fall precipitation	IN	ANN	eastuspr.fal	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	mm - digitized from Lamb*
Eastern U.S. reconstructed annual precipitation	IN	ANN	eastuspr.ann	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	mm - digitized from Lamb*
Eastern U.S. reconstructed winter temperature	IN	ANN	eastus.win	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	digitized from Lamb*
Eastern U.S. reconstructed spring temperature	IN	ANN	eastus.spr	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	digitized from Lamb*
Eastern U.S. reconstructed summer temperature	IN	ANN	eastus.sum	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	digitized from Lamb*
Eastern U.S. reconstructed fall temperature	IN	ANN	eastus.fal	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	digitized from Lamb*
Eastern U.S. reconstructed annual temperature	IN	ANN	eastus.ann	1738-1967	vortex c:\frank\climate5\histser\allfiles.zip	digitized from Lamb*
Central England	IN	O	cengtmp.dat	1659-1897	vortex c:\frank\climate5\histser\allfiles.zip	Monthly - see paper file*
Prague-Klementinim, Czech. winter temperature anom.	IN	DEC	pragtemp.win	1761-1900	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1771-1980*
Prague-Klementinim, Czech. spring temperature anom.	IN	DEC	pragtemp.spr	1761-1900	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1771-1980*
Prague-Klementinim, Czech. summer temperature anom.	IN	DEC	pragtemp.sum	1761-1900	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1771-1980*
Prague-Klementinim, Czech. fall temperature anom.	IN	DEC	pragtemp.fal	1761-1900	vortex c:\frank\climate5\histser\allfiles.zip	Anomalies from 1771-1980*
Seoul, Korea annual total precipitation	IN	ANN	seoulpre.ann	1771-1961	vortex c:\frank\climate5\histser\allfiles.zip	mm*
Long term NH station seasonal temperatures	IN	SEA	ch13.dat	1701-1987 (varies)	vortex c:\frank\climate5\histser\allfiles.zip	See Climate Since A.D. 1500, Chapter 13
Agassiz Ice Cap volcanic scratch volts	IO	ANN	sch84s1y.a84	1223-1961	vortex c:\frank\climate5\histser\fisher\allfiles	Bore hole A84*
Agassiz Ice Cap electrical conductivity	IO	ANN	a77sc.a77	433-1853	vortex c:\frank\climate5\histser\fisher\allfiles	Bore hole A77*
Crete, Greenland ice core acidity	IO	ANN	crete.acd	553-1972	vortex c:\frank\climate5\histser\allfiles.zip	71°07'N, 37°19'W*
CH_4 mixing ratio from Law Dome, Ant.	IO	O	ethch498.xls	1008-1992	vortex c:\frank\paleo\allfiles.zip	Irregular time intervals
CO_2 concentration ratio from Antarctic ice and firn	IO	O	ethco296.xls	1006-1969	vortex c:\frank\paleo\allfiles.zip	Irregular time intervals
GISP2 volcanic sulfate	IO	VAR	110k volcanic SO4.GISP2	last ~110,000 years	vortex c:\frank\paleo\zielinski	From Zielinski
Solar irradiance reconstructed from 14C and 10Be	IO	VAR	bardirrad.txt	843-1961	vortex c:\frank\paleo\data	From Bard et al., Tellus, 2000
Vostok dust concentration	IO	VAR	dustnat1.txt	~4500 BP-421,000 BP	vortex c:\frank\ray\nature1.zip	From Petit et al., 1999, Nature - see readme1.doc in same zip file
Vostok sodium concentration	IO	VAR	nanat1.txt	last ~420,000 years	vortex c:\frank\ray\nature1.zip	From Petit et al., 1999, Nature - see readme1.doc in same zip file
Vostok methane concentration	IO	VAR	ch4nat1.txt	~2300 BP-417,000 BP	vortex c:\frank\ray\nature1.zip	From Petit et al., 1999, Nature - see readme1.doc in same zip file
Vostok CO_2 concentration	IO	VAR	co2nat1.txt	~2300 BP-414,000 BP	vortex c:\frank\ray\nature1.zip	From Petit et al., 1999, Nature - see readme1.doc in same zip file
Hoyt reconstructed solar irradiance	O	ANN	hoyt	1700-1992	vortex c:\frank\climate1\paleo\paleo.zip	From D. Hoyt
Lean reconstructed solar irradiance	O	ANN	lean.196	1600-1999	vortex c:\frank\climate1\paleo\paleo.zip	From J. Lean
Lean reconstructed solar irradiance	O	ANN	lean1012	1600-1999	vortex c:\frank\climate1\paleo\paleo.zip	From J. Lean
Lean reconstructed solar irradiance	O	ANN	jlean	1611-1988	vortex c:\frank\climate1\paleo\paleo.zip	From J. Lean
Cumulative NH dust veil index	O	ANN	cumnh.dvi	1500-1985	vortex c:\frank\climate1\paleo\paleo.zip	See program cumnhdvi.f in paleo.zip-uses NDP013 from CDIAC
Lean reconstructed solar irradiance	O	ANN	lean900.doc	900-1800	vortex c:\frank\paleo\allfiles.zip	From J. Lean
N. Urals upper limit of trees above modern treeline	O	50Y	russtree.dat	850-1990	vortex c:\frank\paleo\data\allfiles.zip	From Shiyatov, 1993
^{10}Be concentration	OI	VAR	be10-jlean	898-1947	vortex c:\frank\climate1\paleo\paleo.zip	From Judith Lean - McHargue and Damon Be^{10}

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^{10}Be concentration	OI	ANN	beer	1423-1985	vortex c:\frank\climate1\paleo\paleo.zip	From Juerg Beer - Dye 3, Greenland
E. N. America summer temp and annual precip	PO	VAR	gaje88.prn	67 BC-1974 (varies)	vortex c:\frank\climate5\histser\gajewski\allf	From K. Gajewski - cores from 8 ponds and lakes
N. America tree ring reconstructions	TR	ANN	northern.data	1400-1980 (varies)	vortex c:\frank\climate1\paleo\paleo.zip	From Gordon Jacoby - several sites
Kolyma River tree ring reconstruction	TR	ANN	kolyma.temp	1545-1989	vortex c:\frank\climate1\paleo\paleo.zip	From C. Earle - see kolyma.treering for more info
Mongolia tree ring reconstruction	TR	ANN	mongolia	1550-1994	vortex c:\frank\climate1\paleo\paleo.zip	From Gordon Jacoby - see file mongolia2 in paleo.zip
Oroko Swamp, New Zealand temperature reconstruction	TR	O	orokonztr.txt	900-1957	vortex c:\frank\paleo	Jan to Mar - silver pine tree rings
Northern Patagonia summer temperature departures	TR	ANN	boninraw.new	1500-1974	vortex c:\frank\climate5\histser\allfiles.zip	From J. A. Boninsegna
British Columbia/Pacific NW temp reconstruction	TR	ANN	briffa.bcp	1600-1982	vortex c:\frank\climate5\histser\allfiles.zip	From K. Briffa - see briffreg.dat and wusrec.dat
California temperature reconstruction	TR	ANN	briffa.cal	1600-1982	vortex c:\frank\climate5\histser\allfiles.zip	From K. Briffa - see briffreg.dat and wusrec.dat
Eastern Rockies/Northern High Plains temp reconstruction	TR	ANN	briffa.ern	1600-1982	vortex c:\frank\climate5\histser\allfiles.zip	From K. Briffa - see briffreg.dat and wusrec.dat
Southwest desert temperature reconstruction	TR	ANN	briffa.swd	1600-1982	vortex c:\frank\climate5\histser\allfiles.zip	From K. Briffa - see briffreg.dat and wusrec.dat
Western U.S. temperature reconstruction	TR	ANN	briffa.wus	1600-1982	vortex c:\frank\climate5\histser\allfiles.zip	From K. Briffa - see briffreg.dat and wusrec.dat
Northern N. America reconstructed temp departures	TR	ANN	ch15.dat	1601-1974	vortex c:\frank\climate5\histser\allfiles.zip	From Darrigo and Jacoby - see Climate Since A.D. 1500, Chapter 15
Grt Plains stand. regional tree ring series & eigen. scores	TR	ANN	ch16.dat	1750-1964	vortex c:\frank\climate5\histser\allfiles.zip	From D. Meko - see Climate Since A.D. 1500, Chapter 16
East US rotated drought fator scores	TR	ANN	ch17.dat	1700-1972	vortex c:\frank\climate5\histser\allfiles.zip	From E. Cook - see Climate Since A.D. 1500, Chapter 17
Northern Fennoscandia recon July/Aug temperatures	TR	ANN	chap19.dat	1580-1978	vortex c:\frank\climate5\histser\allfiles.zip	Fr Briffa and Schweingruber-see Climate Since A.D. 1500, Chap 19
UK, Scand, and C. Eur. Recon of Apr-Sep temperature	TR	ANN	chap19.dat	1750-1975	vortex c:\frank\climate5\histser\allfiles.zip	Fr Briffa and Schweingruber-see Climate Since A.D. 1500, Chap 19
NW Russia reconstructed June/July temperature	TR	ANN	chap20.dat	961-1969	vortex c:\frank\climate5\histser\allfiles.zip	From Graybill and Shiyatov-see Climate Since A.D. 1500, Chap 20
Santiago de Chile reconstructed winter precipitation	TR	ANN	ch23.dat	1500-1972	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Subtrop.anticyclone belt summer and winter positions	TR	ANN	ch23.dat	1500-1974	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Chiloe reconstructed summer precipitation	TR	ANN	ch23.dat	1556-1985	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Ushuaia first eigenvactor amplitudes	TR	ANN	ch23.dat	1751-1984	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
N. Patagonia reconstructed summer temperature	TR	ANN	ch23.dat	1500-1974	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Rio Alerce reconstructed summer temperature	TR	ANN	ch23.dat	1500-1983	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Atuel, Neuquen, and Limay R. mean annual flow	TR	ANN	ch23.dat	1575-1970	vortex c:\frank\climate5\histser\allfiles.zip	From Boninsegna - see Climate Since A.D. 1500, Chap 23
Lake Coleridge, NZ reconstructed summer rainfall	TR	ANN	ch24.dat	1880-1977	vortex c:\frank\climate5\histser\allfiles.zip	From Norton and Palmer - see Climate Since A.D. 1500, Chap 24
Hurunui, NZ reconstructed summer river flow	TR	ANN	ch24.dat	1880-1977	vortex c:\frank\climate5\histser\allfiles.zip	From Norton and Palmer - see Climate Since A.D. 1500, Chap 24
New Zealand reconstructed summer temperature	TR	ANN	ch24.dat	1730-1982	vortex c:\frank\climate5\histser\allfiles.zip	From Norton and Palmer - see Climate Since A.D. 1500, Chap 24
N. America northern treeline reconstructed temperature	TR	ANN	darrigo.dat	1601-1974	vortex c:\frank\climate5\histser\allfiles.zip	From R. D'Arrigo
Western U.S. temperature reconstruction	TR	ANN	frittslo.dat	1602-1961	vortex c:\frank\climate5\histser\allfiles.zip	From Fritts and Lough (1985 Climatic Change)
Eastern U.S. temperature reconstruction	TR	ANN	frittslo.dat	1602-1961	vortex c:\frank\climate5\histser\allfiles.zip	From Fritts and Lough (1985 Climatic Change)
U.S. and SW Canada temperature reconstruction	TR	ANN	frittslo.dat	1602-1961	vortex c:\frank\climate5\histser\allfiles.zip	From Fritts and Lough (1985 Climatic Change)
Srinagar, India reconstructed summer temperature	TR	ANN	srinagar.dat	1660-1980	vortex c:\frank\climate5\histser\allfiles.zip	34 11 N, 74 49 E
Tasmania reconstructed summer temperature	TR	ANN	tasmania.ser	900-1989	vortex c:\frank\climate5\histser\allfiles.zip	From Cook et al.
Rio Alerce reconstructed summer temperature	TR	ANN	villalba.dat	869-1983	vortex c:\frank\climate5\histser\allfiles.zip	From Villalba - also see ch23.dat (Boninsegna uses this series)
U.S. annual, spring, and summer regional (15) temps	TR	ANN	wusfrtts.dat	1602-1961	vortex c:\frank\climate5\histser\allfiles.zip	From Fritts book, Fig. 3.1, p. 36
Tornetrask, Sweden temperature reconstruction	TR	ANN	tornrec.dat	500-1980	vortex c:\frank\paleo\data\allfiles.zip	From Briffa et al.
Northeast US tree ring data	TR	ANN	225 files	1509-1994 (varies)	vortex c:\frank\paleo\treering	New England + NY,NJ,PA,MD - various parameters
Lake Tuborg (3 core) varve thicknesses	VR	ANN	tuborg.xls	1694-1995	vortex c:\frank\paleo	

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From: Raymond S. Bradley
To: Michael E. Mann
Cc: mhughes@ltrr.arizona.edu
Subject: Re: data
Date: Friday, September 27, 2002 7:59:13 AM

I'm familiar with this paper (& another similar one that I believe is in press in The Holocene). But this GRL paper mixes up some decent records with a few crappy ones (Jinchuan peat oxygen isotopes, Taiwan C/N in lake sediments, C-13 in Japanese trees...) that are not clearly related to temperature, as claimed. So, we should use these data selectively. Malcolm & I will be at a meeting in China in mid-October, with a main goal to find the best East Asian records and capture them...
By the way, did you se Cook et al, GRL 29, 14, 10.1029/2001GL014580 2002 [I hate these new citations!]
"Evidence for a "Medieval Warm Period" in a 1100 year tree-ring reconstruction of past austral summer temperatures in New Zealand"

Ray

.At 12:53 PM 9/25/02 -0400, you wrote:
>Dear All,
>
>Please check this out:
>
>GEOPHYSICAL RESEARCH LETTERS, VOL. 29, NO. 9, 10.1029/2001GL014485, 2002
>General characteristics of temperature variation in China during the last
>two millennia
>Bao Yang
>Institute of Cold and Arid Regions Environmental and Engineering, Chinese
>Academy of Sciences,
>China
>Achim Braeuning
>Institute for Geography, University of Stuttgart,
>Stuttgart, Germany
>Kathleen R. Johnson
>Department of Earth and Planetary Science, University of California,
>Berkeley, CA, USA
>Shi Yafeng
>Institute of Geography and Limnology, Chinese Academy of Sciences,
>Nanjing, China
>Abstract
>[1] Three alternate China-wide temperature composites covering the last
>2000 years were established by combining multiple paleoclimate proxy
>records obtained from ice cores, tree rings, lake sediments and historical
>documents. Five periods of temperature variation can be identified: a warm
>stage in AD 0–240, a cold interval between AD 240 and 800, a return to
>warm conditions from AD 800–1400, including the Medieval Warm Period
>between AD 800–1100, the cool Little Ice Age period between 1400–1920, and
>the present warm stage since 1920. Regional temperature variation is found
>during AD 800–1100, when warm conditions occurred in Eastern China and in
>the northeastern Tibetan Plateau and in AD 1150–1380, when the southern
>Tibetan Plateau experienced a warm interval. In contrast, evidence for
>cool conditions during the LIA is more consistent among the proxy records.
>The temperature reconstructions for China and the Northern Hemisphere show
>good agreement over the past millennium.
>Received 30 November 2001; revised 21 February 2002; accepted 28 February
>2002; published 11 May 2002.

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>
>
>We should get ahold of these data, if possible, to add to the candidate
>predictors for our reconstructions.
>
>Hopefully, the authors will make them available (does anyone have good
>contacts w/ these folks?). At worst, they can be digitized at decadal
>resolution...
>
>cheers,
>
>mike
>
>_____
>   Professor Michael E. Mann
>   Department of Environmental Sciences, Clark Hall
>   University of Virginia
>   Charlottesville, VA 22903
>_____
>e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137
>   http://www.evsc.virginia.edu/faculty/people/mann.shtml

Raymond S. Bradley
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Paleoclimatology Book Web Site: http://www.geo.umass.edu/climate/paleo/html

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From: Michael E. Mann
To: tom crowley
Cc: mann@virginia.edu; mhughes@ltrr.arizona.edu
Subject: Re: 70 year cycle
Date: Monday, May 28, 2001 11:09:01 AM

Thanks Tom,

Will check that out...

mike

At 01:02 PM 5/28/01 -0500, you wrote:
>Mike thought you might be interested in this too, Tom
>
> >Date: Mon, 28 May 2001 12:52:44 -0500
> >To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>
> >From: tom crowley <tom@ocean.tamu.edu>
> >Subject: 70 year cycle
> >Cc: tcrowley@ocean.tamu.edu
> >Bcc:
> >X-Attachments: :Macintosh HD:28321:Arizona_GDI2.pc:
> >
> >Hi Malcolm,
> >
> >attached is a ps comparison of the band passed 70 yr oscillation from my
> >"conveyor index" with your sw U.S. ppt reconstruction - the GDI2 refers to
> >a composite from Gisp2, Dye3, and Iceland sea ice back to AD 1000.
> >
> >two things can be stated -
> >
> >(1) the correlation from 1600-present is spectacular - 0.96 this is v nice
> >(2) the correlation is nonstationary - over the whole record r=0.64 (still
> >nice) but there are clearly times when the indeces are almost out of
> >phase. this creates problems - one could rationalize that the correlation
> >depends on the basic state of the atmosphere, which changes as climate
> >changes, blah blah blah - but it does require more thought before it can
> >be written up
> >
> >if something convincing could be stated this correlation has interesting
> >implications for desert ecology - my understanding is that the correlation
> >in the instrumental part of the record is mainly with summer ppt - winter
> >ppt may be more influenced by the Pacific. If so one would predict a
> >rough cyclicity in the diversity of desert biota - during times of high
> >summer ppt one might have a more Chihuaha Desert assemblage, during times
> >of lower ppt it might be more Sonoran - but this may be going too far.
> >
> >it is also necessary to redo the correlation - a particular band is
> >instructive but not convincing when discussing an oscillation that is only
> >quasi-cyclical. There are smoothing techniques that can be applied to the
> >raw data that restore more of the irregularity in the oscillation - I have
> >done that with the GDI2 index but would need you data to repeat the same
> >pattern. can you send the composited data used for the time series
> >analysis?
> >
> >regards, Tom
> >
>

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>
>
>Thomas J. Crowley
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>979-845-0795
>979-847-8879 (fax)
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---

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http://www.evsc.virginia.edu/faculty/people/mann.shtml

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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu
Subject: stuff
Date: Thursday, November 16, 2000 1:58:01 PM

Hi Malcolm,

Emails flying back and forth! Unfortunately, I've got to head off to a tenure talk by one of my colleagues.

But wanted to get the results to you on the comparison. IN a separate email, I've attached 30 year lowpassed versions of your PDO recon and the MBH98 PC#5. FOr the latter, I have lagged it (adanced it forward in time) by 30 years, which
represents roughly about 1/2 cycle, and corresponds to the negative phase of EOF #5, ie, a colder than normal central north Pacific. This correlates with the positive anomaly in your PDO recon (r=0.52 for the 30 year lowpassed series,
not perfect, but statistically significant). So I would say the comparison is favorable. One intepretation of the differences is that the global and North American data may be saying different things about the phase of the signal. An argument for merging the data!

You may like to plot the two series yourself and compare. Let me know what you think

mike

Professor Michael E. Mann
Department of Environmental Sciences, Clark Hall
University of Virginia
Charlottesville, VA 22903

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From: Michael E. Mann
To: srutherford@virginia.edu
Cc: Malcolm Hughes; alexeyk@rosie.ldgo.columbia.edu; mevans@lgo3.harvard.edu
Subject: Re: yesterday"s visit
Date: Friday, May 19, 2000 9:45:22 AM

Dear all,

For all of those who don't know, Scott Rutherford is a research scientist now working with me at U.Va (and w/ Ray and Malcolm) on expansions and methodological improvements of the multiproxy climate reconstruction work, for the next couple years.

I am asking Scott, when he has the chance, if we would please post the original MBH98 dataset of 100+ indicators on an anonymous location on our server (holocene.evsc.virginia.edu) which will be available to those who are interested.

We will notify you all when this is available. Questions should be directed to Scott.

mike

At 05:32 AM 5/19/00 -0700, Malcolm Hughes wrote:
>Dear Mike - it would be good if we can find the file structure you
>had. THere is no longer any problem with the Stockton data - I think
>I mentioned to you last Fall that Chuck was happy for them to be
>released. I think we stand to gain quite a lot by making the dataset
>easily available - there could be a cottage industry of Kaplans,
>Evans's, maybe even Lalls and Crowleys trying to do new things
>and each time they would have to refer back to the work for which
>the dataset was collated. In that sense I think Mike is probably right
>in saying that it could be a 'commodity'. I don't see that we have
>anything to lose, as we're well on the way to having something even
>better.
>THe issue came up precisely on the point that you predicted, and
>Aleksei had expressed genuine puzzlement at their failure to do
>better with the tree rings and their Pacific SST stuff. There are
>some aspects of it that I find puzzling too, but the obvious comment
>was that they hadn't 'high-graded' their data set for the target signal.
>I also suspect that your approach is getting the large scale patterns
>better because: a) of the global (+/-) extent of the dataset; and b)
>because although it only looks as if we were looking at 110
>records, we were really using the distilled information from three or
>four times as many, and even that was a quality-controlled set. Plus
>of course the value of hte specific methods used. CHeers, Malcolm
>Malcolm Hughes
>Professor of Dendrochronology
>Laboratory of Tree-Ring Research
>University of Arizona
>Tucson, AZ 85721
>520-621-6470
>fax 520-621-8229
>
>

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From: Michael E. Mann
To: Raymond S. Bradley; p.jones@uea.ac.uk; mhughes@ltrr.arizona.edu; wigley@ncar.ucar.edu
Cc: Tim Osborn; Keith Briffa
Subject: Re: Yang et al
Date: Sunday, June 22, 2003 6:04:46 PM
Attachments: proxymap.pdf

Hi Ray,

I'm in Volcano national park on my Honeymoon, so comment will be brief, by necessity...

In our GRL article, Phil and I weighted the records we used with respect to their decadal correlations with the instrumental gridpoint surface temperature data for the same region (numbers in parentheses in attached figure 1 from the paper), so if a series is truly crap in an objectively determined sense, it got very low weight. The China series has a reasonable (r=0.22), but not great correlation--and it gets a moderate low weight.

In my opinion, this is a better approach then simply deeming a record crap a priori (and then getting criticized for not considering it). We considered all available records with appropriate resolution that are putative temperature estimates, and weighted them objectively.

We also did careful cross-validation on the resulting reconstruction using independent instrumental data, etc.---so I hardly think we are subject to criticism in how we used the available data, relative to other analyses that have been done...

As for the Eos piece, I think a similar point holds--not showing it at all would seem a conspicuous omission. We could add the local correlation values to each of the panels of Figure 2, and comment briefly--this could be done at the proof stage.

I'll leave this to Phil (or Keith or Tim, who are helping out since Phil is also on vacation) to take care of, as I have promised not to get involved with this sort of stuff until my honeymoon is over. Phil and I can discuss this, if need be, when we meet in Sapporo in a couple weeks,

mike

At 06:37 PM 6/22/2003 -0400, Raymond S. Bradley wrote:

> Phil:
> You commented that the Chinese series of Yang et al (GRL 2002) looked weird. Well, that's because it's crap--no further comment on what stuff gets into GRL!
>
> You appear to have used their so-called "complete" China record. You really should consider what went into this --2 ice core delta 18O records of dubious relationship to temperature (one is cited as correlating with NW China temperatures at r=0.2-0.4), 3 tree ring series, one of which is a delta C-13 record of questionable climatic significance (to be generous). The other series include two records from a Taiwan lake--a carbon/nitrogen isotope and a total organic carbon series (interpreted as high="warm, wet") and an oxygen isotope series from cellulose in peat!!!

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(& don't ask about the C-14 based chronology, interpolated to decadal averages!)
I loved this sentence:
"Although a quantitative relationship between the proxy records of the Jinchuan peat, the Japan tree-ring series and the Taiwanese sediment records with modern climate data are not given in the original works, the qualitative connectivity with temperature as the dominant controlling factor has undoubtedly been verified"
Oh, undoubtedly!! And these are 4 of the 9 series going into the "complete China" record..
Finally, they use another record based on "phenology" and (somehow) this provides a winter temperature series....

You just shouldn't grab anything that's in print and just use it 'cos it's there---that just perpetuates rubbish. This series needs to be removed from Figure 2 in the EOS forum piece--and if you included it in your GRL paper, I suggest that you reconsider it.
Ray

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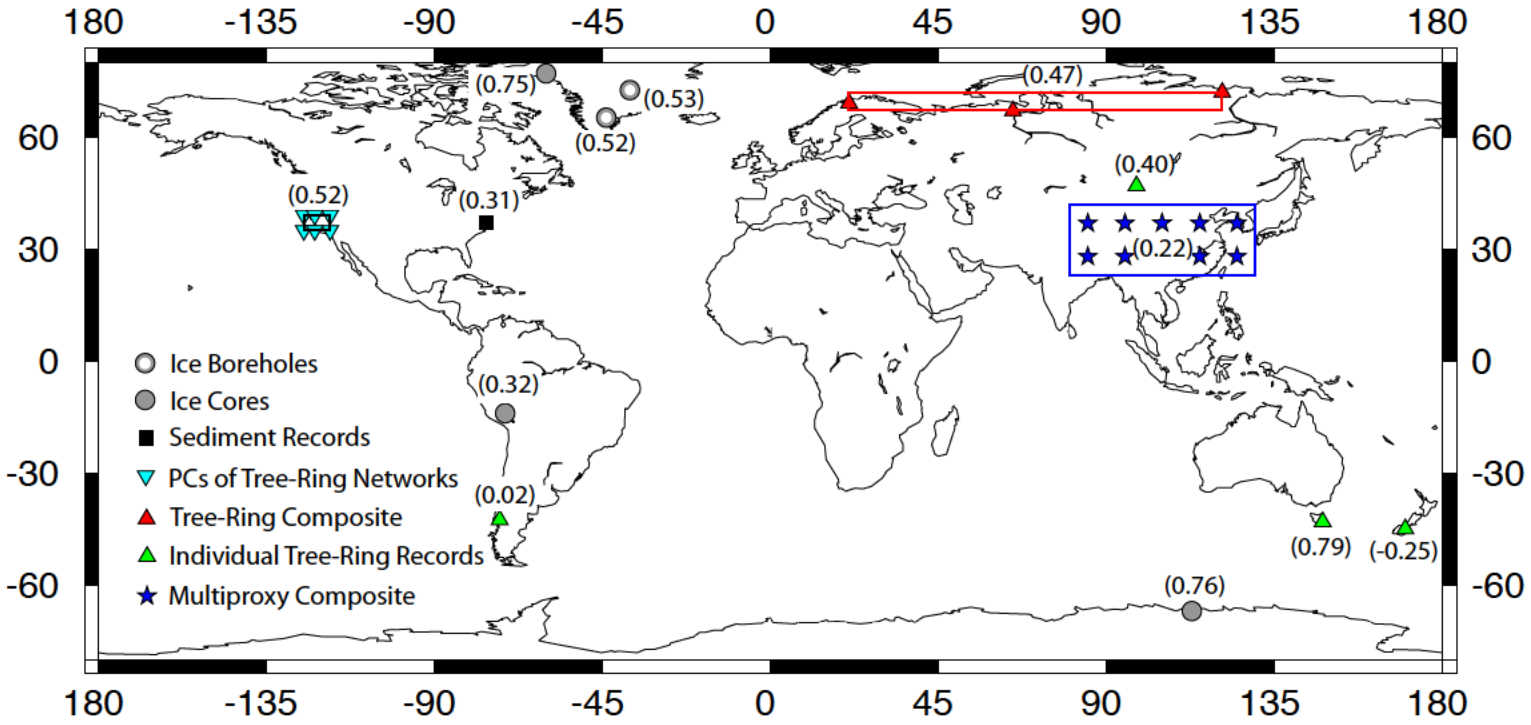

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From: Michael E. Mann
To: Tim Osborn
Cc: srutherford@virginia.edu; k.briffa@uea; p.jones@uea
Subject: Re: my visit
Date: Friday, September 22, 2000 12:35:16 PM

HI Tim,

Very busy, so just a short response for the time being.

Regarding our MBH98 and GRL99 datasets, I'm pretty sure that Scott put those on anonymous ftp for you some months ago. So you *should* already have had access to all the data we used. In fact, it was only a few select series of Malcolm's that weren't made available from the get-go. So data has never been an issue for us. I'm happy to hear that it is not an issue for you/keith/phil and that you are ready to make your density data available...

A few points of clarification might help here:

The revised method (based on ridge regression) is currently in development as far as paleoreconstruction is concerned (we have a paper to be submitted on application to the instrumental record only). We intend to test it on synthetic proxy datasets (as described in my previous email) before applying it to actual proxy data, so your visit, unfortunately, occurs at a time that is too premature for comparison with results from this method. Rather, we were hoping
you shared some of the interest along the lines of
developmental/methodological
issues.

Comparison between warm-season reconstructions would be fine, but you should be aware of the extreme caveats with regard to our seasonal reconstructions, as spelled out in detail in our "Earth Interactions" article. We don't do nearly as well for warm-season or cold-season as for annual-mean, and we believe this is consistent w/ the mix of seasonal information contained in the multiproxy dataset. Obviously, things are somewhat different for the more seasonally homogeneous density chronology dataset. So to us, this comparison might not
seem as worthwhile as it would for you all, but we can do it if all provisos and caveats are fully recognized and embraced from the start...

The idea of testing wavelet methods of distinguish contributions on different timescales sounds like it is of interest to all of us, and
perhaps we can
move in that direction during your visit.

In any case, we'll have more than enough to do, talk about, investigate, and no need to necessarily hammer it all out beforehand.

Comments from others (Scott, Phil, Keith?) welcome,

mike

At 09:24 AM 9/22/00 +0100, Tim Osborn wrote:
>At 10:11 19/09/00 -0400, you wrote:
>>I will put you up at the "Red Roof Inn" for the 10 nights...
>>Will have reservations made for you for the night of the 10th through 19th,
>>checking out morning of the 20th...

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>
>That sounds great. Thanks.
>
>
>Mike,
>
>I've talked over various ideas with Keith and Phil (and I'm cc'ing this to
>them as well as to Scott), and I've now made some slightly firmer/clearer
>suggestions, combining your ideas and ours.
>
>(1) We're still keen to spend part of the time on reconstruction method
>issues, since that is one of the specifics that our current funded project
>needs to address. To avoid being too retrospective, we could do something
>that combined both your Nature98 and your revised methods:
>
>(a) compare your summer/warm season reconstructions (old & new methods)
>with our reconstructions of Apr-Sep temperature from tree-ring densities
>(regional/hemispheric averages and spatial comparisons).
>
>(b) In (a), we would be comparing reconstructions based on different
>palaeodata *and* different statistical reconstruction methods. So a better
>approach would be to use your (old & new) methods with our tree-ring
>density data set to reconstruct Apr-Sep temperature fields, and then
>compare with our reconstructions. This would be a good way of comparing
>methods.
>
>(c) We could exchange data/methods to continue comparisons after the end of
>my visit. We would be keen, for example, to obtain your Nature98 & GRL99
>datasets and software to play around with after my return. In exchange, we
>can provide you with our tree-ring density data set and the reconstructions
>that we have produced from it. Of course, such subsequent work would
>continue to be collaborative, keeping each other informed/involved with the
>work.
>
>(d) If the tree-ring density data provided useful "added value" to your
>reconstructions (perhaps at the higher frequencies and providing finer
>spatial detail?), then we could use an appropriate method (perhaps your new
>revised one) to produce a new reconstruction using all palaeodata. Such a
>reconstruction might prove to be an important and well-used product.
>
>(2) Of your two specific suggestions I quite strongly prefer the first.
>The reason is that, again, our project specifically requires comparison of
>palaeo and model data and the development of appropriate methods to do
>this. Your first suggestion would take us along those lines. There are
>two related strands here. The first is to use the model outputs to assess
>the reliability of the reconstructions (i.e., following the ideas you laid
>out in your e-mail), which is certainly of interest. The second is to use
>the reconstructions to evaluate the model simulations of "natural"
>variability. We've done some comparisons with the HadCM2 and HadCM3
>simulations - I shall brings papers/results along. What we need to develop
>further are ways of incorporating the paleo biases/errors in such
>comparisons. We have begun this, but when I visit we might be able to come
>up with better methods and apply them to Hadley Centre and/or GFDL
>comparisons.
>
>Your second suggestion, while interesting, is less appealing at this stage,
>principally because we won't have time to do everything. As it happens,
>Keith and I have just submitted a paper (to that well-known(!) journal
>"Dendrochronologia") about timescale-dependent calibration of tree-ring
>data - I shall bring a copy with me. My feeling is that the quantity of

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>data overlap available for calibration would be a strongly limiting factor
>in most timescale-dependent approaches, whether they use wavelets or some
>other filtering-type approach. What interests me more would be the
>application of wavelets to the full palaeorecords to facilitate in the
>definition of timescale-dependent coherent patterns (PCs?), rather than
>just to the calibration period. Anyway, we can talk these ideas over even
>if there's no time to begin any work yet.
>
>I think that a chance to exchange preprints, data, and discuss ongoing
>developments of our work and yours will, in itself, prove to be a useful
>outcome of my visit.
>
>Best regards
>
>Tim
>
>
>
>Dr Timothy J Osborn | phone: +44 1603 592089
>Senior Research Associate | fax: +44 1603 507784
>Climatic Research Unit | e-mail: t.osborn@uea.ac.uk
>School of Environmental Sciences | web-site:
>University of East Anglia _____| http://www.cru.uea.ac.uk/~timo/
>Norwich NR4 7TJ | sunclock:
>UK | http://www.cru.uea.ac.uk/~timo/sunclock.htm
>
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>

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From: raymond s. bradley
To: mhughes@ltrr.arizona.edu; mann@multiproxy.evsc.virginia.edu
Subject: possible response?
Date: Tuesday, October 28, 2003 4:02:53 PM

Now I've read their paper, there are some wierd things that we should look into, though I am sure they will have no bearing on our overall results. But in this "death by 1000 cuts" approach to science, we have to make sure we can't be slowly bled to death...
Do you think we should respond as below, or forget about it?
ray

To The Editor

Energy and The Environment

Dear XX,
We request that the following statement be published in your journal at the earliest opportunity.

The recent paper by McIntyre and McKitrick (Energy and Environment, 14, 751-771) claims to be an "audit"of the analysis of Mann, Bradley and Hughes (1998). An audit involves a careful examination, using the same data and following the exact procedures used in the report or study being audited. McIntyre and McKitrick did not use the same data or procedures, and so their results have no bearing on ours, and certainly do not constitute an audit. Their results are notable only in how remarkably inconsistent they are with every published study of temperature variations of the last 600 years.

Journals that receive critical comments on a previously published paper always provide the authors who are being criticized an opportunity to review the study prior to publication, and offer them the chance to respond. This is standard operating procedure in all peer-reviewed scientific journals. We were never given this opportunity. It is unfortunate that many of the errors that now appear in print in the McIntyre and McKitrick article could have been corrected, so that readers who are less familiar with the topic would not have been misled.

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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu; raymond s. bradley
Subject: Re: possible response?
Date: Tuesday, October 28, 2003 7:28:47 PM

Malcolm, Ray, forget about all of this.

E&E will need to issue a retraction, I promise! All will be revealed in about 10 minutes...

mike

At 07:19 PM 10/28/2003 -0700, mhughes@ltrr.arizona.edu wrote:

> Dear Ray and Mike - I'm in Krasnoyarsk at a conference, and today is my one
> limited opportunity to check e-mail. I have not read this latest attack, and
>
> will not be able to before the middle of next week, so I cannot say anything
> definite. Certainly the tone and content of the proposed reply look good, but
> I'd better read what we respond to before committing. Cheers, Malcolm
> Quoting "raymond s. bradley" <rbradley@geo.umass.edu>:
>
> > Now I've read their paper, there are some wierd things that we should look
> > into, though I am sure they will have no bearing on our overall
> > results. But in this "death by 1000 cuts" approach to science, we have to
> > make sure we can't be slowly bled to death...
> > Do you think we should respond as below, or forget about it?
> > ray
> >
> >
> > To The Editor
> >
> > Energy and The Environment
> >
> > Dear XX,
> > We request that the following statement be published in your journal at the
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> >
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> > 751-771) claims to be an "audit"of the analysis of Mann, Bradley and Hughes
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> inconsistent they are with every published study of temperature
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> of the last 600 years.
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> published paper always provide the authors who are being criticized an
> opportunity to review the study prior to publication, and offer them the
> chance to respond. This is standard operating procedure in all
> peer-reviewed scientific journals. We were never given this
> opportunity. It is unfortunate that many of the errors that now appear
in
> print in the McIntyre and McKitrick article could have been corrected, so

> that readers who are less familiar with the topic would not have been
> misled.
>
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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu; Scott Rutherford
Cc: mann@multiproxy.evsc.virginia.edu
Subject: Re: the usual stuff
Date: Thursday, October 30, 2003 2:46:35 AM
Attachments: mcintyre_02.pdf

Malcolm, Ray, Scott...

It looks like they've severely misrepresented the Mann et al proxy data in their supposed recreation of the dataset (what give the result Figure 6d and their Fig 7 (bottom) that look so ridiculous.

I'll need your help to confirm this isn't my imagine. I believe this is what they've done:

Look at table 7.5 in their paper (attached). If I'm reading correctly, they've completely misrepresented the PC series. They've obliterated most of our data prior to 1600 based on their inability to find the same versions of the data underlying our PCs on the WDCP (even though we clearly have those individual series that make up the PCs in the appropriate subdirectory of our public ftp site: ftp://holocene.evsc.virginia.edu/pub/MBH98/

If so, the pre-1600 proxy data set they have created has nothing whatsoever to do w/ the MBH proxy data set. They've eliminated all of the early ITRDB and Stahle PC series, because they couldn't find the corresponding series on the WDCP site! Is this really what they've done???

Please all read and let me know if this is your interpretation too. If so, this is scandalous, absolutely scandalous. A brazen act of intellectual dishonesty. But I need some 2nd, 3rd, etc. opinions as to whether or not they've really done something so alarming here!!!

thanks, now back to sleep for me...

mike

At 12:22 AM 10/30/2003 -0700, mhughes@ltrr.arizona.edu wrote:

> Mike - I don't know if I've been getting all the correspondence, but I've certainly got plenty! I did see the one with the submitted version of the riposte to USA Today, but didn't see anything about whether they will carry it. As for the other point, we might want to consider sending the response to Energy and Environment - after all, their turn-round time is fast - in the expectation that they will not publish it. Maybe there are other possibilities as well as web sites? My gut feeling is to avoid advocacy outlets even though they are sympathetic - in the long run that would damage our credibility with, for example, the lieberan/McCains of this world. How about Scientific American, or the Chronicle? Dick Kerr and his ilk could also be vlable too. I hope you are getting some sleep and rest now - adrenaline cold turkey is a horrible sensation so be careful! Also - heed Mike Oppenheimer's wise and kind words! These guys (or their allies) will hit back in some way, so let's not shoot all our bullets at once.
> Back to the middle taiga.... CHeers, Malcolm
> Quoting "Michael E. Mann" <mann@virginia.edu>:
>
> >
> >
> > Hi Malcolm,

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>
>
> have you been recieving all the correspondences? There is still the
> possibility that the op-ed will run in USA Today tomorrow. We took the
> liberty of signing you on, even though we couldn't get confirmation from
> you on the final draft...
>
>
> Meanwhile, I've already discovered numerous major errors, and still
> finding some more. I'm taking the initial stab that you and Ray took at
> drafting a more formal response, and turning it into a detailed
> description of their mistakes.
>
>
> I'm still open to thoughts about what to do with this. I personally don't
> think that we should submit a response to E&E--that implicitly would
> recognize it as a legitimate forum. And we can't do that.
>
>
> We could post the response on an appropriate website, and broadcast its
> availability to the community. I'm guessing that David Appell would be
> more than happy to provide a link from his blog to this...
>
>
> mike
>
>
> At 08:33 PM 10/29/2003 -0700, mhughes@ltrr.arizona.edu wrote:
>
>
>
>
> Mike - I assume you were dealing
> with the following all along -
>
> http://www.uoguelph.ca/~rmckitri/research/trc.html
>
> Cheers, malcolm
>
> _____
>
>
> Professor Michael E. Mann
>
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> of Environmental Sciences, Clark Hall
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From: Michael E. Mann
To: Tim Osborn
Cc: k.briffa@uea.ac.uk; Phil Jones; raymond s.bradley; mhughes@ltrr.arizona.edu
Subject: Re: Fwd: op ed for USA Today
Date: Thursday, October 30, 2003 4:24:49 AM

Thanks a bunch Tim,

Well, we didn't add your name because we weren't sure, but USA Today probably won't publish it--if not we may try to distribute it.

But more importantly, as we speak, I am drafting a long description of what they done wrong. Just over the last 24 hours I've discovered something extremely dishonest that it appears they did. In their reconstruction based on their 'redo' of the MBH98 proxy network, the one that shows the ridiculous warming in the early centuries, it appears that they eliminated all of our ITRDB Western North American (and Stahle max latewood chronologies) from our network. As you guys know, the ITRDB WNA data are fairly important to our reconstruction. Based on Table 7.5 in their paper, if you read the fine details, it looks like they've just eradicated the earlier data because they claim they couldn't find it on the NGDC website--even though we all know the data are there. And more importantly, all of those data were on our public ftp site on holocene.

So in one extremely dishonest stroke of data eradication, they removed the most important indicators from our network from 1400-1600--and I'm pretty sure that's how they get their spike. Would be interesting to see what cross-validation they get using *their* network available from 1400-present. I bet we're talking REs approaching negative infinity...

So I think that is what they did! Do you guys have the paper--does anyone mind double-checking, and assuring that I'm correct about this. If I am, this is really scandalous, and it should be as broadcast as widely as possible. Note that they don't even report how many proxy data were available in their network back in time, they only show the # of reported/found proxies in the Mann et al network (apparently our data site was missing a few of the series). This is probably intentional as well--they didn't want to show how many series they had actually eliminated from the set. And of course, if they're using a completely different set of proxies, then the would have to reapply the selection rules, they can't just use the basis set that we had determined, based on application of the selection rules to the data at hand...

So its looking increasingly dishonest, deceptive, and intentionally so. I've identified other problems, they used an incorrect version of the the Mann et al proxy dataset that Scott had put into excel format, so the early PC proxy series were overprinted w/ later ones kept in the same column. And they used inconsistent CRU surface temperature datasets and inconsistent normalization conventions to un-normalize the Mann et al EOFs, etc. And all of this could lead to significant differences. But I think its the dropping of the key predictors w/ barely a mention, that gives them the AD 1400-1600 spike

Second opinions--am I imagining this?

Thanks,

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mike

At 10:44 AM 10/30/2003 +0000, Tim Osborn wrote:

> At 17:45 29/10/2003, you wrote:
>
> > We need to submit within the next hour or so, so its really do-or-die time!
>
> Mike,
>
> was away yesterday, so I missed all the fun-and-games! If you went ahead and submitted it with my name on anyway, then that's fine because I would have agreed had I been here. If you dropped me in my absence, then fine too - you had enough co-signees, I'm sure.
>
> Going back to an earlier email when you were asking whether anyone had reviewed the E&E piece by M&M (have I got the initials correct? have to avoid confusion with M&M sweets - do you get them in the US? some are nuts, which seems appropriate!). Anyway, just wanted to confirm that I did not review it.
>
> Despite the hard and time consuming work that it evidently took you to get to the bottom of their work's problems, I think it was essential to get this cleared up so soon. It's important to get this information out as publicly as possible, so that nobody who wants to push the M&M conclusions can do so while claiming ignorance of the fact that data problems make their conclusions baseless and wrong. If you want to avoid the climatesceptics list then perhaps one of us (or all of us?) here in CRU could circulate a note to that list, hence the cc to Keith and Phil. Let us know. Do you ever use the CLIMLIST mailing list? It's not generally a debating type list, but I'm sure it would be relevant to post something there that makes clear the M&M conclusions are invalid - as a public information service?
>
> Cheers
>
> Tim
>
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> Norwich NR4 7TJ, UK
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> phone: +44 1603 592089
> fax: +44 1603 507784
> web: http://www.cru.uea.ac.uk/~timo/
> sunclock: http://www.cru.uea.ac.uk/~timo/sunclock.htm

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From: Keith Briffa
To: Michael E. Mann; Tim Osborn
Cc: raymond s.bradley; mhughes@ltrr.arizona.edu; Phil Jones; Scott Rutherford
Subject: Re: Can you believe it???
Date: Thursday, October 30, 2003 10:02:59 AM

Mike and others
I am sorry but been in a meeting all day - my first impression of reading the text is to caution against releasing this statement without more discussion. Do not be bounced into saying stuff you are not sure of , and using emotive language that smacks of too emotional a response . I am staying a while to read and comment in detail - and will try to fax something. Have to go soon because of daughter and need to write 2 PhD proposals tonight . Please clarify if there is a deadline that you are working too and what target is this piece aimed at.?

Keith

At 09:35 AM 10/30/03 -0500, Michael E. Mann wrote:
>Guys,
>
>I'm right, aren't I????
>
>mike
>
>At 02:13 PM 10/30/2003 +0000, Tim Osborn wrote:
>
>>At 14:02 30/10/2003, you wrote:
>>>Guys, can you take a look at this.
>>>
>>>I think that everything I say here is true! But we've got to be sure.
>>>
>>>There are more technical things they did wrong that I want to add, but
>>>this is the critical bit--what do you think. Comments? Thanks...
>>>
>>>mike
>>>
>>>_____
>>>The recent paper by McIntyre and McKitrick (Energy and Environment, 14,
>>>751-771) claims to be an "audit" of the analysis of Mann, Bradley and
>>>Hughes (1998) or "MBH98". An audit involves a careful examination,
>>>using the same data and following the exact procedures used in the
>>>report or study being audited. McIntyre and McKitrick ("MM") have done
>>>no such thing, having used neither the data nor the procedures of MBH98.
>>>Their analysis is notable only in how deeply they have misrepresented
>>>the data, methods, and results of MBH98. Journals that receive critical
>>>comments on a previously published papers always provide the authors who
>>>are being criticized an opportunity to review the study prior to
>>>publication, and offer them the chance to respond. This is standard
>>>operating procedure in any legitimate peer-reviewed scientific journal.
>>>Mann and colleagues were never given this opportunity, nor were any
>>>other leading paleoclimate scientists that we're familiar with. It is
>>>unfortunate that the profound errors, and false and misleading
>>>statements, and entirely spurious results provided in the McIntyre and
>>>McKitrick article were ever allowed to see the light of day by those
>>>would have been able to detect them. . We suspect the extremely
>>>checkered history of "Energy and Environment" has some role to play in
>>>this. The authors should retract their article immediately, and issue a

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>>>public apology to the climate research community for the injustice they
>>>have done in publishing and promoting this deeply deceptive and flawed
>>>analysis.
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>>>
>>>
>>>Not only were critical errors made in their analysis that render it
>>>thoroughly invalid, but there appear to have been several strikingly
>>>subjective decisions made to remove key indicators of the original MBH98
>>>network prior to AD 1600, with a dramatic impact on the resulting
>>>reconstruction. It is precisely the over which the numerous indicators
>>>were removed (pre 1600 period) during which MM reconstruct anomalous
>>>warmth that is in sharp opposition to the cold conditions observed in
>>>MBH98 and nearly all other independent published estimates that we know of.
>>>
>>>
>>>
>>>While the authors dutifully cite the small inconsistency between the
>>>number of proxy indicators reported by, and found in the public data
>>>archive, of Mann et al back in time (there indeed appear to have been
>>>some minor typos in the MBH98 paper), it is odd that they do not cite
>>>the number of indicators in their putative version of the Mann et al
>>>network based on the independent collection of data, back time. The
>>>reader is literally left to do a huge amount of detective work, based on
>>>the tables in their pages 20-23, to determine just what data have been
>>>eliminated from the original Mann et al network. It seems odd, indeed,
>>>that their "substitutions" of other versions (or in some case, only
>>>apparent, and not actual, versions) of proxy data series for those in
>>>the original Mann et al (1998) network has the selective effect of
>>>deleting key proxy indicators that contribute dramatic cooling during
>>>the 16th century, when the MM reconstruction shows an anomalous warming
>>>departure from the Mann et al (1998) and all other published Northern
>>>Hemisphere temperature reconstructions.
>>>
>>>
>>>
>>>Here are some blatant examples:
>>>
>>>
>>>
>>>1) The authors (see their Figure 4) substitute a younger version of one
>>>of the Jacoby et al Northern Treeline series for the older version used
>>>by MBH98. This substitution has effect of removing a predictor of 15th
>>>century cooling [Incidentally, MM make much of the tendency for some
>>>tree ring series, such as this one, to show an apparent cooling over the
>>>past couple decades. Scientists with expertise in dendroclimatology know
>>>that this behavior represents a decrease in the sensitivity to
>>>temperature in recent decades that likely is related to conditions other
>>>than temperature which are limiting tree growth]
>>>
>>>
>>>
>>>2) The authors eliminate, without any justification, the entire dataset
>>>of 70 Western North American (WNA) tree-ring series available between
>>>1400 and 1600 (this dataset is represented, by MBH98, in terms of a
>>>smaller number of representative Principal Component time series). The
>>>leading pattern of variance in this data set exhibits conditions from
>>>1400-1800 that are dramatically colder than the mid and late
>>>20th century, and a very prominent cooling in the 15th century in
>>>particular. The authors eliminated this entire dataset because they

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>>>claimed that the underlying data was not available in the public domain.
>>>
>>>
>>>
>>>In point of fact, not only were the individual WNA data all available on
>>>the public ftp site provided by Mann and colleagues:
>>>ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/ITRDB/NOAMER/, but they
>>>were also available, despite the claims to the contrary by MM, on NOAA's
>>>website as well:
>>>ftp://ftp.ngdc.noaa.gov/paleo/treering/chronologies/northamerica/usa
>>>
>>>
>>>
>>>The deletion of this critical (see Mann et al, 1999) dataset appears
>>>to one of the more important censorings performed by MM that allows
>>>them to achieve their spurious result of apparent 15th-16th century warmth.
>>>
>>>
>>>
>>>We have not, as yet, finished determining just how many important
>>>indicators were subtly censored from the MBH98 dataset by the various
>>>subjective substitutions described on pages 20-23. However, given the
>>>relatively small number of indicators available between 1400-1500 in the
>>>MBH98 network (22-24) and their elimination of some of the more critical
>>>ones, it would appear that this subjective censoring of data, alone,
>>>explains the spurious, misleading, and deceptive result achieved by the
>>>authors.
>>>
>>>
>>>
>>>Incidentally, MBH98 go to great depths to perform careful
>>>cross-validation experiments as a function of increasing sparseness of
>>>the candidate predictors back in time, to demonstrate statistically
>>>significant reconstructive skill even for their earlier (1400-1450)
>>>reconstruction interval. MM describe no cross-validation experiments. We
>>>wonder what the verification resolved variance is for their
>>>reconstruction based on their 1400-1450 available network, during the
>>>independent latter 19th century period?
>>>
>>>
>>>
>>>There are numerous other serious problems that would render the MM
>>>analysis completely invalid, even in the absence of the serious issue
>>>raised above, and these are detailed below
>>>
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>>>.
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>>>
>>>_____
>>> Professor Michael E. Mann
>>> Department of Environmental Sciences, Clark Hall
>>> University of Virginia
>>> Charlottesville, VA 22903
>>>_____
>>>e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

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>>> http://www.evsc.virginia.edu/faculty/people/mann.shtml
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From: Michael E. Mann
To: Keith Briffa; raymond s. bradley; Tim Osborn; p.jones@uea.ac.uk
Cc: mhughes@ltrr.arizona.edu
Subject: Re: One way out....
Date: Thursday, October 30, 2003 10:44:49 AM

Thanks Keith,

I see the mutual collaboration as well underway now, w/ the Rutherford et al paper sort of representing our pilot effort. I much look forward to increasingly closer interaction among the group-that can only lead to good things, better science, a better understanding of the science--so this all sounds good to me.

I think its appropriate to note that are still legitimate differences and uncertainties (as indicated in the spread of different empirical and model estimates shown in the various spaghetti plots we've all produced). But that *this* is not one of them--I think all of the errors I've documented in MM are correct, in particular the very convenient censoring of ITRDB PC #1 and one of the oldest Jacoby tree-ring series of the network, and that's how they get that ridiculous result...But if you think some details aren't clear, I'd like to discuss them/try to clarify them. I'd like to hear what everyone thinks about the facts.

We can soften the tone. I'm pretty darned sure of the facts, having spent about 4 days pouring over this, looking at the data series, re-reading their descriptions, looking at their codes, etc...So I'd like to discuss any questions in what I've written, after you all have had time to read over the paper, my response, etc...

thanks,

mike

At 05:11 PM 10/30/2003 +0000, Keith Briffa wrote:

> Ray et al
> I agree with this idea in principle . Whatever scientific differences and fascination with the nuances of techniques we may /may not share, this whole process represents the most despicable example of slander and down right deliberate perversion of the scientific process , and bias (unverified) work being used to influence public perception and due political process. It is , however, essential that you (we) do not get caught up in the frenzy that these people are trying to generate, and that will more than likely lead to error on our part or some premature remarks that we might regret. I do think the statement re Mike's results needs making , but only after it can be based on repeated work and in full collaboration of us all. I am happy to push Tim to take the lead and collaborate in this - and I feel we could get sanction very quickly from the DEFRA if needed. BUT this must be done calmly , and in the meantime a restrained statement but out saying we have full confidence in Mike's objectivity and independence - which we can not say of the sceptics. In fact I am moved tomorrow to contact Nature and urge them to do an editorial on this . The political machinations in Washington should NOT

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dictate the agenda or scheduling of the work - but some cool statement can be made saying we believe the "prats have really fucked up someway" - and that the premature publication of their paper is reprehensible . Much of the detail in Mikes response though is not sensible (sorry Mike) and is rising to their bate.
Keith

At 11:55 AM 10/30/03 -0500, raymond s. bradley wrote:

> Tim, Phil, Keef:
> I suggest a way out of this mess. Because of the complexity of the arguments involved, to an uniformed observer it all might be viewed as just scientific nit-picking by "for" and "against" global warming proponents. However, if an "independent group" such as you guys at CRU could make a statement as to whether the M&M effort is truly an "audit", and if they did it right, I think that would go a long way to defusing the issue.
> It's clear from the figure that Reno Knuti sent yesterday that something pretty whacky happened in their analysis prior to ~AD1600, and this led Mike to figure out the problem. See: file:///c:/eudora/attach/nh_temp_rec.jpg
>
> If you are willing, a quick and forceful statement from The Distinguished CRU Boys would help quash further arguments, although here, at least, it is already quite out of control.....yesterday in the US Senate the debate opened on the McCain-Lieberman bill to control CO2 emissions from power plants. Sen Inhofe stood up & showed the M & M figure and stated that Mann et al--& the IPCC assessment -- was now disproven and so there was no reason to control CO2 emissions.....I wonder how many times a "scientific" paper gets reported on in the Senate 3 days after it is published....
> Ray

--
Professor Keith Briffa,
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From: raymond s. bradley
To: mann@multiproxy.evsc.virginia.edu; mhughes@ltrr.arizona.edu
Subject: revised commentary
Date: Thursday, October 30, 2003 7:51:33 PM
Attachments: Rebuttal1.doc

Mike--see attached edited version. I think a figure comparing the two series is essential. I've heavily edited the text and inserted some comments for you to consider. I think the overall statement is great--just needs to pass through the diplomatic filter
Ray
(I just see there's a "rebuttal2 file, so I hope I didn't waste my time on an old version....too many messages with the same subject line flying by today, so it became confusing...)

Raymond S. Bradley
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Paleoclimatology Book Web Site: http://www.geo.umass.edu/climate/paleo/html

The recent paper by McIntyre and McKitrick (Energy and Environment, 14, 751-771) claims to be an "audit" of the analysis of Mann, Bradley and Hughes (1998) or "MBH98". An audit involves a careful examination, using the same data and following the exact procedures used in the report or study being audited. McIntyre and McKitrick ("MM") have done no such thing, having used neither the data nor the procedures of MBH98. Thus, it is entirely understandable that they do not obtain the same results. Their effort has no bearing on the work of MBH98, and is in no way a "correction" of that study, as they claim. Their analysis is notable only in how deeply they have misrepresented the data, methods, and results of MBH98.

Journals that receive critical comments on a previously published papers always provide the authors who are being criticized an opportunity to review the study prior to publication, and offer them the chance to respond. This is standard operating procedure in ~~any~~ all ~~legitimate~~ peer-reviewed scientific journals. Mann and colleagues were never given this opportunity, nor were any other leading paleoclimate scientists asked to evaluate the purported "corrections". ~~that we're familiar with~~. It is unfortunate that the profound errors, ~~and~~ false and misleading statements, and ~~entirely~~ spurious results provided in the McIntyre and McKitrick article were ever allowed to see the light of day. ~~We suspect the extremely checkered history of "*Energy and Environment*" has some role to play in this.~~ The authors should retract their article immediately, and ~~issue a public apology to the climate research community for~~acknowledge publically that their claim that they undertook a careful audit of our work is completely incorrect. They have done no such thing. Furthermore, the journal *Energy and Environment* should immediately publish a statement that the so-called "corrections" to MBH98 were wrong, and in fact completely unwarranted. ~~the~~ MM and the journal Editor have greatly misled the scientific community and the public at large by~~injustice they have done in~~ publishing and promoting this ~~deeply~~ extraordinarily ~~deceptive and~~ flawed analysis.

Not only were critical errors made in their analysis that render it thoroughly invalid, but there appear to have been several strikingly subjective decisions made to remove key indicators of the original MBH98 network prior to AD 1600, with a dramatic impact on the resulting reconstruction (see Figure 1). It is precisely the interval (1400-1600~~)~~) -- when~~over which numerous indicators were over which~~ MM reconstruct anomalous ~~warmth~~ warmth -- that is in sharp opposition to the cold conditions ~~observed in~~reconstructed by MBH98. Furthermore, the MM results are in stark disagreement with ~~and~~ nearly all other independent published estimates of past trends in Northern Hemisphere mean temperature. Their results also make no sense in that the interval of apparent warmth that they "discover" in their "correction" to our work, corresponds to one of the coldest periods of the "Little Ice Age". Had MM been more familiar with the scientific literature, this alone should have alerted them to some problems in their analysis.

While the authors dutifully cite ~~the~~ some minor~~small inconsistency~~ inconsistencies between the number of proxy indicators reported by MBH98 and those~~, and~~ found in ~~the~~ our public data archive, ~~of Mann et al back in time~~ (there indeed appear to have been some minor typos in the MBH98 paper), it is ~~odd~~ curious that they do not cite the number of indicators in *their* ~~putative~~ "corrected" version of the Mann et al network based on the independent collection of data, back in time. The reader is literally left to do a huge amount of detective work, based on the tables in their pages 20-23, to determine just what data have been eliminated from the original Mann et al network. It seems odd, indeed, that their "substitutions" of other versions of proxy data series (or in some case, only apparent, and not actual, versions) ~~of proxy data series~~ for those in the original Mann et al (1998) network has the selective effect of *deleting key proxy indicators that*

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Comment [RSB1]: Mike—we need a plot here of their reconstruction & ours, annotated to point out how the two records diverge before ~1600. You subsequent text explains (a) why these differences exist, and (b) why there are also small discrepancies between MBH98 and MM03. But a picture is worth ~1000 words…

Comment [RSB2]: our ftp site?, or WDC-A?…or both?

Comment [RSB3]: Too obscure…I assume you are refering here to the data mangling issue dealt with later on…?

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contribute dramatic cooling during the 15th century~~,~~. Hence, ~~when~~ the MM reconstruction erroneously shows ~~an~~ an anomalous ~~warming~~ warm period at that time, unlike Mann et al (1998) and all other published Northern Hemisphere temperature reconstructions.

For readers interested in more specific details of the data and analytical problems in the MM03 paper, we provide further details below.
~~Here are some blatant examples:~~

1) The authors (see their Figure 4) substitute a shorter version (back to mid 16th century) of one of the Jacoby et al Northern Treeline series for the longer version (back to mid 15th century) used by MBH98. This substitution the has effect of removing a predictor of 15th century cooling [Incidentally, MM make much of the tendency for some tree ring series, such as this one, to show an apparent cooling over the past couple decades. Scientists with expertise in dendroclimatology know that this behavior represents a ~~-~~decrease in the sensitivity to temperature in recent decades that likely is related to conditions other than temperature which are limiting modern tree growth]

2) The authors eliminate, without any justification, the entire dataset of 70 Western North American (WNA) tree-ring series available between 1400 and 1600 (this dataset is represented, by MBH98, in terms of a smaller number of representative Principal Component time series). The leading pattern of variance in this data set exhibits conditions from 1400-1800 that are dramatically colder than the mid and late 20th century, and a very prominent cooling trend in the 15th century ~~in particular~~. The authors eliminated this entire dataset because they *claimed* that the underlying data ~~was~~ were not available in the public domain. In point of fact, not only were the individual WNA data all available on the public ftp site provided by Mann and colleagues: ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/ITRDB/NOAMER/, but they were also available, despite the claims to the contrary by MM, on NOAA's website ~~as well~~:
ftp://ftp.ngdc.noaa.gov/paleo/treering/chronologies/northamerica/usa

The deletion of this critical dataset appears to~~-~~ be one of the key ~~censoring operation~~errors performed by MM~~-~~ that ~~allows them to achieve~~leads to their spurious results of apparent 15th-16th century warmth.

3) The entire ~~-~~dataset of Stahle and coworkers of Southwestern U.S./Mexican late wood ring width measurements prior to the 17th century (12 back to 1500, 6 back to 1400) was eliminated, again based on a false claim that the underlying data series were not available in the public domain. Once again, the data were available at the ~~-~~Mann et al ftp site:
ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/STAHLE/SWM/

We have not determined yet, just how many important indicators were subtly ~~censored~~ eliminated from the MBH98 dataset by the various subjective substitutions described on pages 20-23. However, given the relatively small number of indicators available between 1400-1500 in the MBH98 network (22-24) and their elimination of some of the more critical ones, it would appear that this subjective censoring of data, alone, explains the spurious, misleading, and deceptive result achieved by the authors. Most importantly, any claim of an "audit" must use the same data and procedures that we did. MM03 did no such thing.

MBH98 go to great ~~depths~~ lengths to perform careful cross-validation experiments as a function of the time interval of the reconstruction, verifying the reconstructive skill of the predictor network as it becomes~~-~~ increasing sparse back in time. Mann et al are able~~-~~ to demonstrate

statistically significant reconstructive skill even for their earlier (1400-1450) reconstruction interval, though the ability to obtain a skillful statistical reconstruction at this time critically depends on a relatively modest number of key predictors. MM have, in effect, eliminated those predictors from the proxy data network. MM describe no cross-validation experiments. We wonder what the verification resolved variance is for their reconstruction based on their 1400-1450 available network (based on cross-validation of the reconstruction during the independent latter 19th century period of the instrumental record), and how it compares with that provided by our reconstruction?

The selective ~~censoring~~ elimination of key indicators in the Mann et al network is an especially devious way to achieve an entirely different reconstruction. MM have effectively censored our key indicators from the 1400-1600 period.

We feel that the above description should be adequate to provide a reader with a sense of why MM have achieved a reconstruction that is markedly inconsistent with at least a dozen other recently published empirical and model-based estimates of Northern Hemisphere mean temperature changes during the 15th-16th centuries.

There are, nonetheless, numerous other more technical ~~-~~problems, ~~however, that would~~ that render the MM analysis invalid for independent reasons:

(a) the use of an EOF decomposition based on one surface temperature data set (MBH98-old version of CRU instrumental surface temperature data) with standardization factors (used to un-normalized normalized EOFS) based on a different temperature data set (MM-new version of CRU dataset) leads to a spatial pattern of bias in the projection of a given eigenvector onto the surface temperature field.

Comment [RSB4]: Need to re-phrase this to clarify use of different data sets and "cross normalization". Is there a better way of saying un-normalise? (here and in next paragraph)

(b) The use of gridpoint standardization factors based on undetrended data (MM) to un-normalize EOFs that had been normalized by standardization factors of detrended data (MBH98) implies a pattern of bias in the projection of an eigenvector onto the surface temperature field that is increasingly large in regions where ~~the~~ 20th century warming is large. Either convention would be ~~ok~~acceptable, but since MM combine EOFs from MBH98 with inconsistent standardization factors from a different temperature data set, they have effectively convoluted the statistics of a detrended and undetrended dataset. Once again, this is inappropriate for somebody who claims to be "auditing" our work. If you don't use the same data and follow the same procedures, you can not expect to obtain the same results.

(c) In the case of the effort ~~to~~ by MM to reproduce the MBH98 results using the MBH98 proxy data set, our preparation of a flawed spreadsheet representation of the data~~:~~ caused unfortunate confusion.

We take responsibility for this error, though ~~we (~~Mann~~)~~ had encouraged the authors to go to the public ftp site and obtain the raw data used by MBH98. Instead, an associate of Mann's was asked to provide ~~(or in any case, did provide, I'm not sure)~~ a spreadsheet format version of the dataset. Unfortunately, in this spreadsheet ~~in which,~~ PCs representing leading patterns of variance in particular proxy sub-networks (evaluated from different sub-intervals) were overprinted into the same column ~~[~~Because MBH98 used a different PC basis representation of the various sub-networks during each interval of their stepwise reconstruction approach, 159, rather than 112 indicators, were necessary to provide all of the proxy indicators necessary to

perform the stepwise regression. Instead, the corresponding, but obviously incommensurate, PC series from different subintervals were successively printed over older values in the spreadsheet. This is why the authors observed a diminished apparent explained variance spectrum in these eigenvector sets. This is also likely the main reason that MM do not reproduce, even using the supposedly 'same' dataset, the precise details of the MBH98 reconstruction, even in the period after AD1600 (See Figure 1). For the earlier reconstructions, the part of the PC series that is used for calibration and for early reconstruction is increasingly inconsistent, due to the overprinting problem. This is probably the reason for an apparent warm bias in the earlier centuries even for the analysis based on the "Mann et al" proxy dataset.

(d) The various 1 year offsets, etc. noted by the authors are an artifact of spreadsheet preparation problems. MM appear to have correctly detected and corrected for these but these minor discrepancies are irrelevant in explaining the large differences MM report in their "correction" of our results..

(e) Lack of the use of an objective criterion in the determination of the number of retained instrumental PCs in the reconstruction creates additional errors in the MM "audit" of our work. ÷

Since the proxy data network developed by MM appears to have differed dramatically (particularly during the 14th-15th century) from that used by MBH98, -as discussed earlier, it is inappropriate to use the same instrumental temperature eigenvector sub-basis for the reconstruction. The sub-basis sets were selected by MBH98 based on the application of an objective criterion to the specific available proxy networks available, and were optimized with respect to those networks. It is completely inappropriate (and simply wrong if undertaking an "audit") to apply the same sub-basis for a different set of proxy indicators than those used by MBH98 in a particular sub-period.

(e) Related to the point raised in (c), MBH98 actually use different PC basis sets of proxy data networks over different intervals of available data to maximize the available statistical information increasingly forward in time, as new series become available. MM appear to have only used PCs over the full (or supposedly full) available interval--thus they have a maximum of 112 indicators, while MBH98 actually have a total of 159 proxy indicator series, with different PC series specific to the particular sub-interval.

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From: Michael E. Mann
To: raymond s. bradley; mhughes@ltrr.arizona.edu
Subject: Re: revised commentary
Date: Thursday, October 30, 2003 8:00:46 PM

HI Ray,

Yes, you were working on a 6 hour old version--I've sent you a version w/ a figure, etc that's much nicer.

Shall I just plan to try to incorporate the suggestions from this one into the newer version, where the suggestions still make sense?

mike

At 09:48 PM 10/30/2003 -0500, raymond s. bradley wrote:

> Mike--see attached edited version. I think a figure comparing the two series is essential. I've heavily edited the text and inserted some comments for you to consider. I think the overall statement is great--just needs to pass through the diplomatic filter
> Ray
> (I just see there's a "rebuttal2 file, so I hope I didn't waste my time on an old version....too many messages with the same subject line flying by today, so it became confusing...)
>
> Raymond S. Bradley
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> Director, Climate System Research Center*
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http://www.evsc.virginia.edu/faculty/people/mann.shtml

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From: Michael E. Mann
To: raymond s. bradley
Cc: Keith Briffa; Tim Osborn; Phil Jones; Malcolm Hughes
Subject: Re: Malcolm just called READ THIS NOW
Date: Friday, October 31, 2003 8:15:32 AM
Attachments: EandEPaperProblem.pdf
EandEPaperProblem.doc

All of Malcolm's suggestions are right on target and in keeping w/ advice from people w/ a legal background I've talked to.

So all of those changes have been made.

Can you guys give this one final read through and just say if you think this is now adequate for release. Sorry for the multiple emails--its the nature of the beast...

mike

p.s. I'm trying to talk Andy Revkin at the New York Times into doing a story on this...

At 09:50 AM 10/31/2003 -0500, raymond s. bradley wrote:

> mike:
> I just spoke to MKH (he'll call you as soon as he can). I read him the latest version...
> He requests:
> 1) changing word "censor" to "remove" throughout text;
> 2) use phrase "appear to have" rather than definitive statements like "have" when refering to MM actions.
> 3) Eliminate words "reputable scientific journal" (see my suggestion below that I was writing as he called...)
> He doesn't want to be included unless these changes are made. If they are, he's happy to sign on. He just wants to make it watertight so they can't come back at us...
>
> I agree with these suggested changes.
>
> In the original version that I edited, the text read:
>
> Journals that receive critical comments on a previously published papers always provide the authors who are being criticized an opportunity to review the study prior to publication, and offer them the chance to respond. This is standard operating procedure in all peer-reviewed scientific journals. Mann and colleagues [We] were never given this opportunity.
>
> I think this is all that is needed on this matter....
> Ray

Professor Michael E. Mann
Department of Environmental Sciences, Clark Hall
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NOTE ON PAPER BY MCINTYRE AND MCKITRICK IN "ENERGY AND ENVIRONMENT"

Michael E. Mann, Raymond S. Bradley, Malcolm K. Hughes

The recent paper by McIntyre and McKitrick (*Energy and Environment*, 14, 751-771, 2003) claims to be an "audit" of the analysis of Mann, Bradley and Hughes (*Nature*, 392, 779-787, 1998) or "MBH98". An audit involves a careful examination, using the same data and following the exact procedures used in the report or study being audited. McIntyre and McKitrick ("MM") have done no such thing, having used neither the data nor the procedures of MBH98. Thus, it is entirely understandable that they do not obtain the same result. Their effort has no bearing on the work of MBH98, and is no way a "correction" of that study as they claim. On the contrary, their analysis appears seriously flawed and amounts to a gross misrepresentation of the work of MBH98. The standard protocol for scientific journals receiving critical comments on a published paper is to provide the authors being criticized with an opportunity to review the criticism prior to publication, and offer them the chance to respond. Mann and colleagues were given no such opportunity.

It seems clear that MM have made critical errors in their analysis that have the effect of grossly distorting the reconstruction of MBH98. Key indicators of the original MBH98 network appear to have been omitted for the early period 1400-1600, with major consequences for the character of the MM reconstruction of Northern Hemisphere temperatures over that interval.

MM do not list the number of indicators in *their* putative version of the MBH network (which is based on an odd combination of data from MBH98 and other sources). The reader must do a considerable amount of detective work, based on scrutiny of the Tables in their pages 20-23 and the indicated data links, to determine just what data have been eliminated from the original MBH network. A preliminary attempt to do this already demonstrates that their deletion of key early proxy information produces anomalous warming in the 15th century at odds with the reconstructed cold conditions of the period by MBH98 and virtually all other published Northern Hemisphere temperature reconstructions.

MM appear to have eliminated key proxy indicators from the MBH98 network by the following actions:

1) MM (see their Figure 4) describe the substitution of a shorter version (available back to mid 16th century) of one of the Jacoby et al (1989) Northern Treeline ring width series for the longer version (available back to mid 15th century) used by MBH98.

2) MM appear to eliminate, without any justification, the entire dataset of 70 Western North American (WNA) tree-ring series available between 1400 and 1600. This dataset, as several other regional tree-ring data networks, is represented by MBH98 in terms of a smaller number of representative Principal Component (PC) time series for each interval. The authors eliminate all of these data by not following (see technical point "b" later on in this document) the procedure of MBH98 of calculating the PC series *separately* for all intervals used in their stepwise reconstruction approach. The leading pattern of variance in this data set exhibits conditions from 1400-1800 that are dramatically colder than the mid and late 20th century, and a very prominent cooling in the 15th century in particular. The original individual proxy data used by MBH, including all of the WNA data have been available since May 2000 on the public ftp site provided by Mann and colleagues: ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/ITRDB/NOAMER/,

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and on the NOAA Paleoclimatology website:
ftp://ftp.ngdc.noaa.gov/paleo/treering/chronologies/northamerica/usa

3) MM appear to eliminate the entire dataset of Stahle and coworkers of Southwestern U.S./Mexican late wood ring width measurements prior to the 17th century (12 back to 1500, 6 back to 1400) under the same false procedural premise described in (2). Once again, the data were available at the Mann et al public ftp site:
ftp://holocene.evsc.virginia.edu/pub/MBH98/TREE/STAHLE/SWM/

We have not determined yet, just how many important indicators were eliminated from the MBH98 dataset by the various subjective substitutions described by MM on pages 20-23. However, we have confirmed that elimination of the critical datasets (1)-(3) alone from the MBH98 network during the interval AD 1400-1500 yields the spurious result obtained by MM. (see Figure 1).

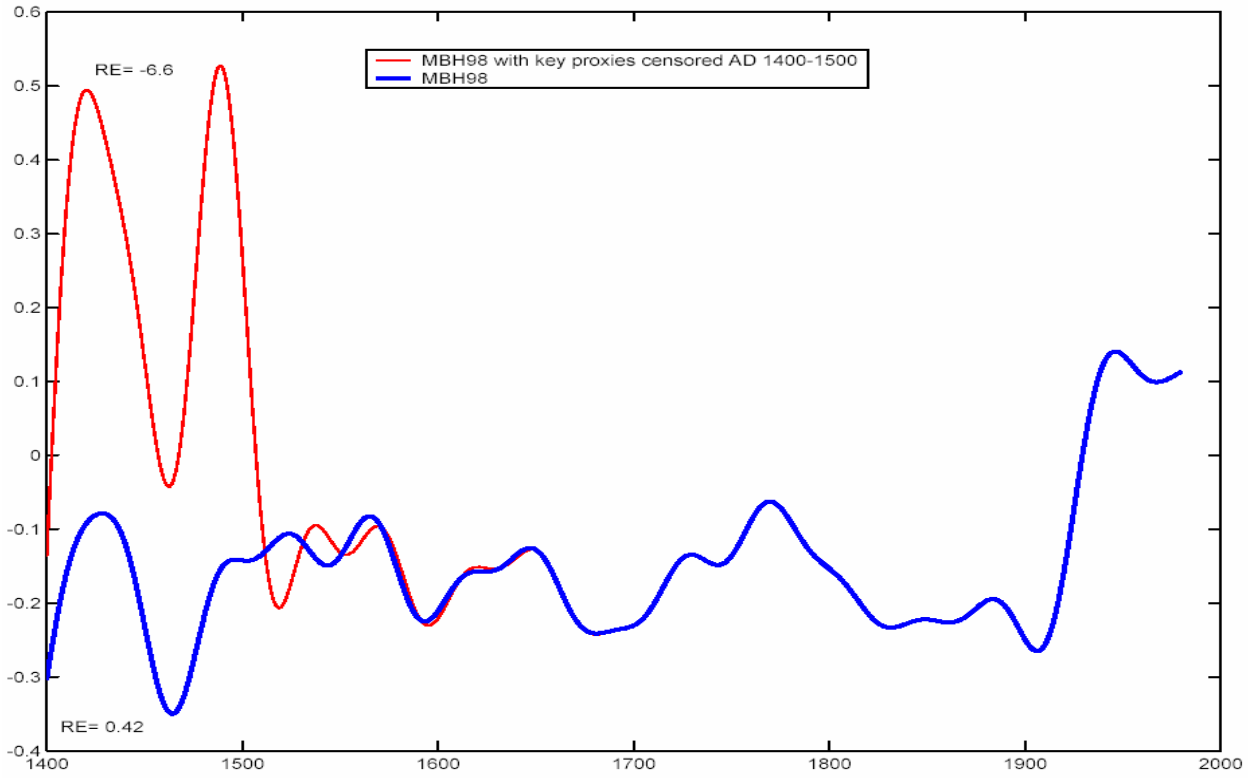

FIGURE 1. COMPARISON OF MBH98 RECONSTRUCTION (BLUE) WITH RECONSTRUCTION RESULTING FROM THE ELIMINATION OF KEY PROXY DATA SETS (1)-(3) OVER THE AD 1400-1500 INTERVAL. THIS YIELDS ESSENTIALLY THE SAME RESULT OBTAINED BY MM BY ELIMINATING A SIGNIFICANT FRACTION OF THE MBH98 DATA AVAILABLE FOR THAT PERIOD (BOTH SERIES HAVE BEEN SMOOTHED WITH A 40 YEAR LOWPASS FILTER).

MBH98 employed the standard statistical tool of cross-validation to verify the skill of their reconstructions. MM describe no such tests. Since increasingly sparse networks are used progressively farther back in time, a series of cross-validation experiments have to be performed to estimate the skill for different time intervals. For the AD 1400-1500 period, this involves, in MBH98, performing the reconstruction over the interval 1400-1901 based on calibration against the instrumental record over the interval 1902-1980, using the specific network of proxy indicators available for the AD 1400-1500 period. The reconstruction is then independently

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compared against the instrumental record over the interval (1854-1901) not used for calibration. The skill can be described by a verification coefficient of determination (RE), which is bounded by negative infinity and positive one, with substantially positive numbers indicative of predictive skill. The mean expected value for a random estimate is -1.

For the reconstruction with the data censored in a manner similar to that implicit in the MM approach, the RE score (-6.6) is far worse than even a typical random estimate, and such a result would have been discarded as unreliable based on the cross-validation protocol used by MBH98.

The anomalous warm values during the 15th century are the artifact of an entirely unreliable statistical estimate. By contrast, the MBH98 reconstruction indicates an RE of 0.42 for the 1400-1500 interval, indicative of significant predictive skill during that time interval.

The above discussion should be adequate to provide readers with a sense of the depth of the flaws underlying the reconstruction achieved by MM that is so at odds with at least a dozen other recently published empirical and model-based estimates of Northern Hemisphere mean temperature changes in past centuries.

There are numerous other additional, more technical problems in their approach that would appear to have rendered the MM analysis flawed irrespective of the censoring of important data. We briefly list the few most significant of these:

(a) Use of Internally Inconsistent Surface Temperature Estimates

MM appear to combine gridpoint standard deviations estimated from one version of the University of East Anglia surface temperature record, with standardized EOFs from MBH98 based on a different temperature data set. MM also appear to inconsistently use standard deviations of un-detrended data, while MBH98 had normalized their EOFs by detrended gridpoint standard deviations.

(b) Incorrect representation of the MBH98 proxy data set.

MBH98 calculated PCs of proxy sub-networks separately for each interval in their stepwise reconstruction. This is the only sensible approach, as it allows all data available over each sub-interval to be used. This requires 159 independent time series to represent all indicators required for reconstructions of all possible sub-intervals, even though the maximum number ever used for a particular sub-interval is 112. By not following this protocol, MM appear to have eliminated in the range of 100 proxy series used by MBH98 over the interval 1400-1600.

(c) Lack of the use of an objective criterion in the determination of the number of retained instrumental PCs in the reconstruction:

Since the proxy data network developed by MM differed from that used by MBH98 for all intervals, it was inappropriate for MM to use the same instrumental temperature eigenvector subsets that had been selected by MBH98 for their reconstruction. The subsets were selected by MBH98 based on the application of an objective criterion to the specific available proxy networks available, and were optimized with respect to those networks. The basis sets used by MM have thus appear not to have been optimized with respect to the *different* proxy network they actually use.

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From: Michael E. Mann
To: Malcolm Hughes; rbradley@geo.umass.edu
Subject: Re: in confidence
Date: Wednesday, November 12, 2003 10:56:57 AM

Malcolm

Thanks--by all means, you guys should look into this. I'm happy to keep hands off!

mike

At 11:08 AM 11/12/03 -0700, Malcolm Hughes wrote:
>Dear Mike and Ray,
>One thing I think we should be able to say in the Climatic Change
>manuscript is
>that there is an easily available, well documented and thoroughly checked
>file
>containing the data we used in MBH98. This may well be what you referred to
>in the recent e-mail to McIntyre- i.e. the version of the fateful file Scott
>produced, but with all sets of PCs. If so, I suggest that we (Ray and
>Frank, me
>and Fenbiao) in collaboration with Scott, and to a lesser extent yourself
>(mainly
>through what you have already done), give it a thorough looking over. We
>should especially make sure that the data in the file really are those
>used in the
>preparation of MBH98.
>I see this as an activity for RSB, MKH nd SR rather that yourself. I think
>it is
>important that we dispose of the data problems completely, and, if any errors
>crept in during the original collation of the dataset, we document them.
>I fully understand and agree with your approach of not being drawn into a
>guerilla campaign with these guys. They are not my main concern. I am
>concerned, however, about how our scientific colleagues view our work in the
>future, and I believe we need to do this for this reason. This affects all
>three of
>us.
>I also understand that this is likely to produce a delay of at least a
>week or two
>in submission of the manuscript, given my involvement next week in the
>CLIVAR/IPCC drought meeting here, and Ray's travel. Even so, I believe
>this to
>be an essential step with considerable long-term benefits.
>Please note that I am sending this only to you two - this is a discussion we
>should have privately.
>Cheers, Malcolm
>.
>.
>
> Malcolm Hughes
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From: Michael E. Mann
To: Raymond S. Bradley; mhughes@ltrr.arizona.edu
Cc: mann@virginia.edu
Subject: Re: CC pt 1
Date: Friday, November 21, 2003 3:40:28 PM

Hi Ray,

Thanks, this sounds good.

Basically, this is my thinking now. We want to go w/ the current analysis, etc. but we should also use this as an opportunity to clear about any uncertainties about methodology, data, etc. Malcolm indicated he would add something on the importance of having carefully filtered the ITRDB data as we did.

Scott is busy preparing the complete documentation of the data, etc. My feeling is that we should refer to the revised website in the Climatic Change paper, before we relay the data to Nature. That way, it can be viewed as a pro-active move on our part (as part of our formal response), rather than a simple reply to a request from Nature. We can make it clear that the data was on ftp the whole time, but that because we are very supportive of other climate/paleoclimate scientists attempting to repeat our analysis, we have made the information available in as transparent a format as possible, etc. You guys can suggest revised wording, etc. but the idea here is that the
revised complete data site will be *part* of our "Climatic Change" paper, and then we can pass that along to Nature.

So I'll await a revised word version from you, a contribution from Malcolm on the description of how we filtered the ITRDB, etc. then incorporate some discussion along the lines above, and then send you guys a revised version for another (final?) round of comments.

I'll be way through sunday afternoon, so probably won't get to looking at any revisions/comments from either of you before then in any case...

Thanks,

mike

At 04:40 PM 11/21/2003 -0500, Raymond S. Bradley wrote:

> I re-wrote the intro....will send you the "Word tracking" version soon, but it was so butchered 9by me) that it's hard to follow. Here's the amended version--see what you think. It avoids redundancy & gets straight to the point better than the first draft, I think:
>
> 1. Introduction
>
> A recent paper by McIntyre and McKitrick (henceforth "MM03") claims to provide evidence that late 20th century hemispheric warmth is not anomalous in the context of the past several centuries, with the specific claim that 15th century temperatures were warmer than those of the late

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20th century. MM03 make this claim based on the purported application of the same methodology and datasets used by Mann et al (1998--henceforth "MBH98"), but their results are very different from those reported by MBH98. MM03 go on to draw far broader implications from their results, arguing against the existence of anthropogenic climate change, and, moreover, the importance of taking action to mitigate it.[could omit this as a diversion....] Their results contrast markedly with a number of studies carried out over the past decade, which reconstruct large-scale surface temperature variations from proxy data (Figure 1). These all arrived at the conclusion that late 20th century Northern Hemisphere mean warmth is anomalous in the context of past centuries and even millennia (Bradley and Jones, 1995; Crowley and Kim, 1996; Overpeck et al, 1997, Jones et al, 1998, Mann et al, 1998; Pollack et al, 1998; Crowley and Lowery, 2000; Huang et al, 2000; Jones et al, 2001, Folland et al, 2001; Briffa et al, 2001; Mann and Jones, 2003; Mann et al, 2003a; Pollack et al, 1998; Huang et al, 2000; Hegerl et al, 2003). Studies employing models of varying complexity forced with estimated past natural and anthropogenic radiative forcing histories have arrived at similar conclusions (Free and Robock, 1999; Crowley and Kim, 1999; Crowley et al, 2000; Bertrand et al, 2002; Gerber et al, 2003; Bauer et al, 2003; Hegerl et al 2003), providing theoretical estimates of Northern Hemisphere mean temperature variations that are statistically indistinguishable from the empirical reconstructions (e.g. Mann et al, 2003). The MM03 study thus conflicts with the work that they claim to have auditedand corrected(i.e. MBH98) and also with most other studies of large-scale temperature variations.

An audit involves a careful examination, using the same data and following the exact procedures used in the report or study being audited. McIntyre and McKitrick ("MM03") have done no such thing, having used neither the data nor the procedures of MBH98. Their effort has no bearing on the validity of the conclusions reported in MBH98, and is no way a "correction" of that study as they claim. On the contrary, their analysis seriously misrepresents MBH98. Here we examine the claim that MM03 undertook exactly the same analysis as MBH98 and found errors in this work, and we seek to understand how they came to this erroneous conclusion. We show that their results derive from the incorrect application of the method of Mann et al (1998) and the use of a different (more restricted) version of the proxy data set used by MBH98.We identify the omission of key early proxy indicators that were used by MBH98 in their network (section 2). We also note a number of erroneous criticisms made of MBH98 in MM03 (section 3), and a number of significant additional technical errors made by MM03 (section 4) that would have rendered their analysis invalid even if they had employed the same key early data as MBH98. Furthermore, we show that the reconstruction presented by MM03 fails the fundamental statistical test of "cross-validation" with independent instrumental data, emphasized in MBH98 and other paleoclimate reconstruction studies (see e.g. Cook et al, 1994; Luterbacher et al, 2002).We present our conclusions in section 5.

Raymond S. Bradley

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From: Michael E. Mann
To: Malcolm Hughes; rbradley@geo.umass.edu
Subject: Re: back..
Date: Monday, February 02, 2004 11:37:32 AM

Hi Malcolm,

We don't want to belabor this point because, as you note, we get a similar result (an even more similar result when we use the correct 98, rather than 110, series) by using the individual series rather than PCs. This is the point we want to emphasize, because otherwise we get into a distracting technical argument with them.

The technical issue is that the series are not stationary AR(1) series. They are perhaps approximately AR(1) prior to the 20th century, and then decidedly not (i.e., they have trends highly significant relative to red noise) during the 20th century. So their experiments are unrealistic, and not useful for the case at hand. I think we want to leave it at that, because the much stronger point is the first one...

Feel free to call later to discuss. I have to head out for an hour or so,

mike

At 11:32 AM 2/2/2004 -0700, Malcolm Hughes wrote:

> Mike - I'm interacting with Ray to produce an edited versionof the response, but there's one point that worries me, and I'd be grateful for your help in my coming to grips with it. It relates to MM's claim that a bias is introduced by the standardization of the ITRDB N American tree ring data prior to calculating PCs using the calibration period. I understand that a result is obtained not unlike our result even if one uses the original variables rather than the PCs, or if this standardization stage is omitted. You then say that MM's "red noise" synthetic data experiments are meaningless, presumably because real instrumental and proxy data do not in fact conform to the red noise model, but in fact have bigger trends than would be expected under that model. Might not the same effect they describe be produced if their experiments been run with a more appropriate model, as described in your reference 9?
> I assume that the problem they describe would arise if the standard deviation of the instrumental period is bigger than the whole period standard deviation in a significant subset of the 70 series - those weighting most strongly are almost certainly those with a dramatic growth surge in the last 100-140 years.
> Hope you had a good trip, Cheers, MalcolmMalcolm Hughes
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From: Michael E. Mann
To: Malcolm Hughes; rbradley@geo.umass.edu
Subject: Re: again...
Date: Wednesday, February 04, 2004 10:47:54 AM

HI Malcolm,

I'll work on this this afternoon. Most of these changes are ok, though I'm not at all happy with changes to one sentence:

"Given a large data set such as we used, alternative reconstructions of the past, [VSC1] , can easily result from the inclusion of particular data". This is an important sentence, and we may need to dicuss this over the phone.

I will try to find a simple and clear way of dealing with the MM03 vs MM04 distinction.

I'll modify the legend/figure captions as suggested, but I'm not sure I'm happy eliminating all of the series you mention. Will reconsider this...

Keep in mind that this reply is intended to get Nature to *reject* the MM04 comment, our aim isn't really to get the back-and-forth exchange published. So I don't think we want to worry about how Nature will reduce our figures, etc. at this point. We want to make sure that the results are clear enough to the Nature editor and possible reviewers that they see MM03 are completely bogus, and recommend rejection...

more later,

mike

At 10:47 AM 2/4/2004 -0700, Malcolm Hughes wrote:

> Mike - I was able to read that version. I make a few more editorial changes, some of which have explanatory comments that you will need to be sure to delete before submission. There may also be the odd comment not linked to a tracked change. I am afraid that the mss will still be difficult for a reader to understand, and this is made worse by the references to MM03. We really must be very careful to limit ourselves as far as possible to the points they raise in MM04 if we are not to lose readers in the first couple of lines. On this point, the figures could still stand simplification - they are going to be one column wide only, and so the text in the "in-figure" legends will be indecipherable withut the use of a magnifying glass. I strongly support Ray's idea of moving all that text to the caption. The reader would also be greatly helped by the removal of certain lines from the diagrams, and any text in the main body or appendix that refer to them. These are:
> Figure 1a: line 5
> Figure 1b:line 3
> Figure 1c line 2
> Ray had a concern about whether we are free to put all the data

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we usedin the public domain- he will call you about this in an hour or so.
I have edited to the calibrate/verify convention throughout (as opposed to the cross validation terminology) for two reasons - 1)- consistency within this manuscript; 2) anumber of colleages in this area of work understand very specific set of procedures when they read the phrase "cross-validation", and will balk at or misunderstand the way it was used here.
I will now be at a major doctor's appointment for a couple of hours, and may not get to looking at the reply to Heike L untill tomorow morning, as have class this evening.
Cheers, Malcolm
.
. Malcolm Hughes
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From: Malcolm Hughes
To: Michael E. Mann
Subject: Re: Fwd: NATURE: 2004-01-14277B
Date: Friday, May 14, 2004 1:10:39 PM

I'm teaching 9 to 5 every day for the next three weeks (intensive summer school, two lectures and a 4-hour lab every day, long weekend field work trip). It would be a lot easier for me to talk early morning (before 8 my time). On a quick perusal, I note that they failed to understand another point, which is that there is no requirement that a record have a linear relationship to local climate. Thus they make it easier to demonstrate that they misunderstood the method used in MBH98. CHeers, Malcolm

On 14 May 2004 at 14:15, Michael E. Mann wrote:

> Ray, Malcolm
>
> Looking over this, I see we need to tighten this up so that the
> reviewers understand what we've shown. If they do, I'm confident we
> can get the MM comment rejected. The main problem here is that we
> apparently weren't crystal clear enough in our explanation.
>
> Unfortunately, at least one of the reviewers clearly was confused
> about MM04c--that reconstruction *is* the best fit to the instrumental
> data during the calibration period based on the restricted available
> predictors--I think our labeling of the figure might have confused
> them into thinking that the calibration RE was negative, when the
> calibration RE is of course positive, while its the verification RE
> that is negative. This was a critical source of confusion.
>
> Finally, I don't see any need to get into the discussion of the
> supposed experiments with 'red noise' series described by MM. We
> simply have to emphasize that the reconstruction based on all 415
> proxies (rather than using PCs of the tree-ring networks) gives the
> same result, so that the standardization used to calculate the PCs
> clearly is not an issue.
>
> In short, we clearly need to simply and only hit the key points, and
> probably only show 2 simplified plots (simplified versions of Figures
> 1a and 1b). We can mention the results of the other experiments
> without showing them, since this appears to have confused reviewers.
>
> I'll get working on a revised version and response, but lets plan to
> discuss early next week. Does monday afternoon work for both of you?
>
> mike
>
> X-Mailer: MIME::Lite 3.01 (F2.6; B2.11; Q2.03)
> Date: Fri, 14 May 2004 16:36:48 UT
> To: mann@virginia.edu
> Subject: NATURE: 2004-01-14277B
> From: r.cotter@nature.com
>
> Content-Disposition: inline
> Content-Length: 8182
> Content-Transfer-Encoding: binary
> Content-Type: text/plain

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> Dear Professor Mann
>
> Some time ago you saw an earlier version of the enclosed comment
> on your paper published in Nature. In the light of the comments
> from our referees, which are enclosed, we asked the authors to
> revise their comment and to reduce it into the correct format for
> a Communication Arising.
>
> Before we reach a decision on publication of this comment and your
> reply to it, we would like you to revise your reply as suggested
> by our referees and to recast it into the correct format for Brief
> Communications Arising. Please accompany your revised reply with a
> short letter explaining the changes you have made in response to
> the comments from the authors and the referees.
>
> We ask you reduce the length of your text to under 600 words and
> the reference list to 15 references or less to conform with our
> guidelines (see www.nature.com/nature/submit/gta/index.html#8).
> Supplementary material is permitted for reviewing purposes only.
>
> We ask you to email the final version of your text to
> m.hutchinson@nature.com as a PC-formatted Word document.
>
> We look forward to receiving your final reply within 4 weeks;
> please let us know if the delay is likely to be longer. Once we
> receive your revised text we send the exchange back out to review.
>
>
> Yours sincerely
> Rosalind Cotter
> Editor, Communications Arising
>
> **********
>
>
>
> Referee #1(Remarks to the Author)
>
> I find merit in the arguments of both protagonists, though MBH is
> much more difficult to read than MM. Their explanations are (at
> least superficially) less clear and they cram too many things onto
> the same diagram, so I find it harder to judge whether I agree
> with them.
>
> There are two main points of dispute:
>
> 1. The principal component technique used.
>
> 2. The quality of the early data.
>
> I deal with 1. first. It is an area where I have expertise, but it
> is not at all clear what exactly is being done. MM talk about
> 'scaling to 1902-1980 mean and standard deviation', whereas MBH's
> phrase is 'restandardisation by detrended standard deviation'.
> These suggest different things to me. The latter seems more
> appropriate than the former, but I am still uneasy about applying
> a standardisation based on a small segment of the series to the
> whole series, if that is what is being done. MBH seem to be too
> dismissive of MM's red noise simulations. Even if red noise is not

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> the best model for the series, they should have reservations about
> a procedure that gives the 'hockey stick' shape for all 10
> simulations, when such a shape would not be expected. Having said
> this, MM's corrected series in their Figure 4c still has the
> upward trend towards the end of the series, so this trend is not
> just an artifact of MBH's PCA procedure.
>
> I am not qualified to say much on 2. but it seems to be the
> crucial point. Both sets of authors agree that the omission of
> some early data changes the early reconstruction considerably. MBH
> say that the omitted data are reliable; MM say they are not. Does
> anyone know who is correct? If there is disagreement among
> experts, then the true behaviour of the series must be very
> uncertain. Incidentally, I am not entirely convinced by MBH's
> dismissal of the MM model reconstruction on the basis of RE. I
> suspect that a lot of the difference is due to the much larger
> variance in the MM model reconstruction compare to MBH's. This is
> probably inevitable, given the reduced sample size for the early
> data.
>
>
> Referee #2(Remarks to the Author)
>
> The technical criticisms raised by McIntyre and McKritik (MM)
> concerning the temperature reconstructions by Mann et al (MBH98),
> and the reply to this criticism by Mann et al is quite difficult
> to evaluate in a short period of time, since they are aimed at
> particular technical points of the statistical methods used by
> Mann et al, or at the use ofparticular time series of proxy data.
> A proper evaluation would require to redo most of the calculations
> presented in both manuscripts, something which is obviously out of
> reach in two weeks time. Furthermore, both manuscripts seem to
> contradict each other in some basic facts.
>
> Therefore, my comments are based on my impression of the
> consistency of the results presented, but there is a wide margin
> of uncertainty that could be resolved only by by looking in detail
> into the whole data set and the whole software used by the
> authors. In general terms I found the criticisms raised by
> McIntyre and McKritik worth of being taken seriously. They have
> made an in depth analysis of the MBH reconstructions and they have
> found several technical errors that are only partially addressed
> in the reply by Mann et al.
>
> 1)Mann et al assert that important features in the reconstruction
> by MM, for instance the increased warmth in the 15th century, is
> due to the fact that they completely ignore the time series from
> the NOAM tree ring data sets. However, MM explicitly state that
> they have used the two leading PCs of this data sets. Of course,
> it is impossible to ascertain who is right and who is wrong in
> this particular point, but I feel that Mann et al should have
> taken into account in their reply the statement by MM concerning
> the NOAM time series.
>
> 2)My doubts expressed in point 1 are strengthen by Figure 1b in
> Mann et al. reply. Mann et al. have tried to replicate in this
> figure the MM reconstruction (MM04c, green line). But one can
> clearly see that the variance of this reconstruction is much
> larger than the observations even in the calibration period.
> Although it might be possible, it seems a very awkward result. Any

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> linear regression method that I am aware of must produce a
> reconstructed predictand with less variance than the observed
> predictand (the rest of the variance being the residuals). It
> seems to me that the something is technically not correct in the
> replication by Mann et al of the MM reconstruction. If the main
> difference between the original MBH98 and the MM04c reconstruction
> is just the elimination of the NOAM data set, why is the variance
> of the reconstruction in the calibration period inflated by a
> factor of 2-3?.
>
> 3)The reply by Mann et al is in my opinion correct when
> requiringMM to present some validation statistics in a validation
> period, and the RE statistics seems to me adequate in this
> context. Since this is the main argument in Mann et al reply I
> would urge MM to address this criticism. The low value of the RE
> statistics in the replicated MM reconstruction (MM04c) indicated
> by Mann et al. seems to be due to the erroneous replication of the
> MM reconstruction. An inspection by eye of the MM04c
> reconstruction seems to indicate that both reconstructions, the
> replicated MM04c and the MBH98 method (1400-1500 model) are more
> or less equally correlated with the instrumental temperature in
> the calibration period, and that the low RE value of the MM04c
> reconstruction stems from its much larger variance. I think that
> this large variance is unrealistic and therefore the real RE value
> should be positive.
>
> 4) The MM reconstruction presented by MM (Fig 4, bottom) should be
> in principle very similar to the replicated reconstruction MM04c,
> but it seems to me that they are not. For instance in Fig4, I do
> not see this excess variance compared to the original MBH98
> reconstruction. This suggests again that something is not correct
> in the calculation of MM04c by Mann et al.
>
> In summary, my recommendation is that MM offer validation
> statistics for their reconstruction and that they make their
> original reconstruction (Fig 4 , bottom) available to MBH, so that
> these authors can also compute validation statistics with the
> original MM reconstruction. Furthermore, it should be explicitly
> cleared up if MM are using or not the NOAM data set. Should this
> validation be successful, I would recommend the publication of
> both manuscripts. Further evaluation requires months of work and
> should be left, in my opinion, to the scientific community. This
> should be the normal scientific process. At this stage, I think
> any Correction or Retraction by MBH98 is premature and really not
> required.
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> _____
> __
> Professor Michael E. Mann
> Department of Environmental Sciences, Clark Hall
> University of Virginia

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From: Michael E. Mann
To: Malcolm Hughes; raymond s. bradley; Scott Rutherford
Subject: Re: [Fwd: huybers on MM05]
Date: Thursday, May 05, 2005 10:50:53 AM

So in case you're keeping count, there are actually 4 comments submitted on MM05, all of them quite critical.

Huybers is one, Ritson is another, Ammann and Wahl comment to GRL on MM05 was rejected w/out review, and an appeal/complaint/investigation is currently underway. There may be malfeasance at GRL--Tom Wigley, Gavin Schmidt, and others have been discussing a possible formal complaint to the president of AGU. Also, there is the von Storch criticism of MM05 (but submitted as a stand-alone paper rather than a comment).

Will keep you all posted,

Mike

p.s. we have some initial *new* reconstructions now! But Zhang, Scott, and I are still ironing out a few small issues. The initial results are promising. Very similar to the past reconstructions, but some interesting differences too. More soon on that...

At 01:23 PM 5/5/2005, Malcolm Hughes wrote:

> Kevin Anchukaitis just passed this on to me- I wasn't aware of it, Malcolm
>
> Return-Path: <kanchuka@ltrr.arizona.edu>
> Received: from schulman.ltrr.arizona.edu ([unix socket])
> by schulman.ltrr.arizona.edu (Cyrus v2.1.9) with LMTP; Wed, 04 May 2005 22:10:51 -0700
> X-Sieve: CMU Sieve 2.2
> Received: from douglass.ltrr.arizona.edu (douglass.ltrr.arizona.edu [128.196.218.203])
> by schulman.ltrr.arizona.edu (8.12.8/8.12.2/LTRR) with ESMTP id j455AphH027922
> for <mhughes@schulman.ltrr.arizona.edu>; Wed, 4 May 2005 22:10:51 -0700
> Received: from [128.196.218.173] (one.ltrr.arizona.edu [128.196.218.173])
> (authenticated bits=0)
> by douglass.ltrr.arizona.edu (8.12.10/8.12.10/LTRR) with ESMTP id j455AkSF014646
> (version=TLSv1/SSLv3 cipher=RC4-MD5 bits=128 verify=NO)
> for <mhughes@ltrr.arizona.edu>; Wed, 4 May 2005 22:10:50 -0700
> Message-ID: <4279AAFD.20604@ltrr.arizona.edu>
> Date: Wed, 04 May 2005 22:11:25 -0700
> From: Kevin Anchukaitis <kanchuka@ltrr.arizona.edu>
> User-Agent: Mozilla Thunderbird 1.0 (Windows/20041206)
> X-Accept-Language: en-us, en
> MIME-Version: 1.0
> To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

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Subject: huybers on MM05
References: <1114807579.42729d1b14ec0@schulman.ltrr.arizona.edu>
<4272A1E5.5030303@ltrr.arizona.edu>
<4272A44A.7080700@ltrr.arizona.edu>
In-Reply-To: <4272A44A.7080700@ltrr.arizona.edu>
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 7bit

hi malcolm,

you are probably already aware, but I see that Peter Huybers has submitted a
comment on the M&M 2005 GRL article:

http://www.mit.edu/~phuybers/

cheers,
k

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From: Michael E. Mann
To: raymond s. bradley; mhughes@ltrr.arizona.edu
Subject: Re: being reviewed by Nature
Date: Wednesday, March 09, 2005 8:16:48 PM
Attachments: figure1.pdf
figure2.pdf
figure3.pdf

---

oops, sorry. here they are...

mike

At 10:10 PM 3/9/2005, raymond s. bradley wrote:

> can you send the 3 figs too
> thanks
> ray
> At 09:29 PM 3/9/2005, you wrote:

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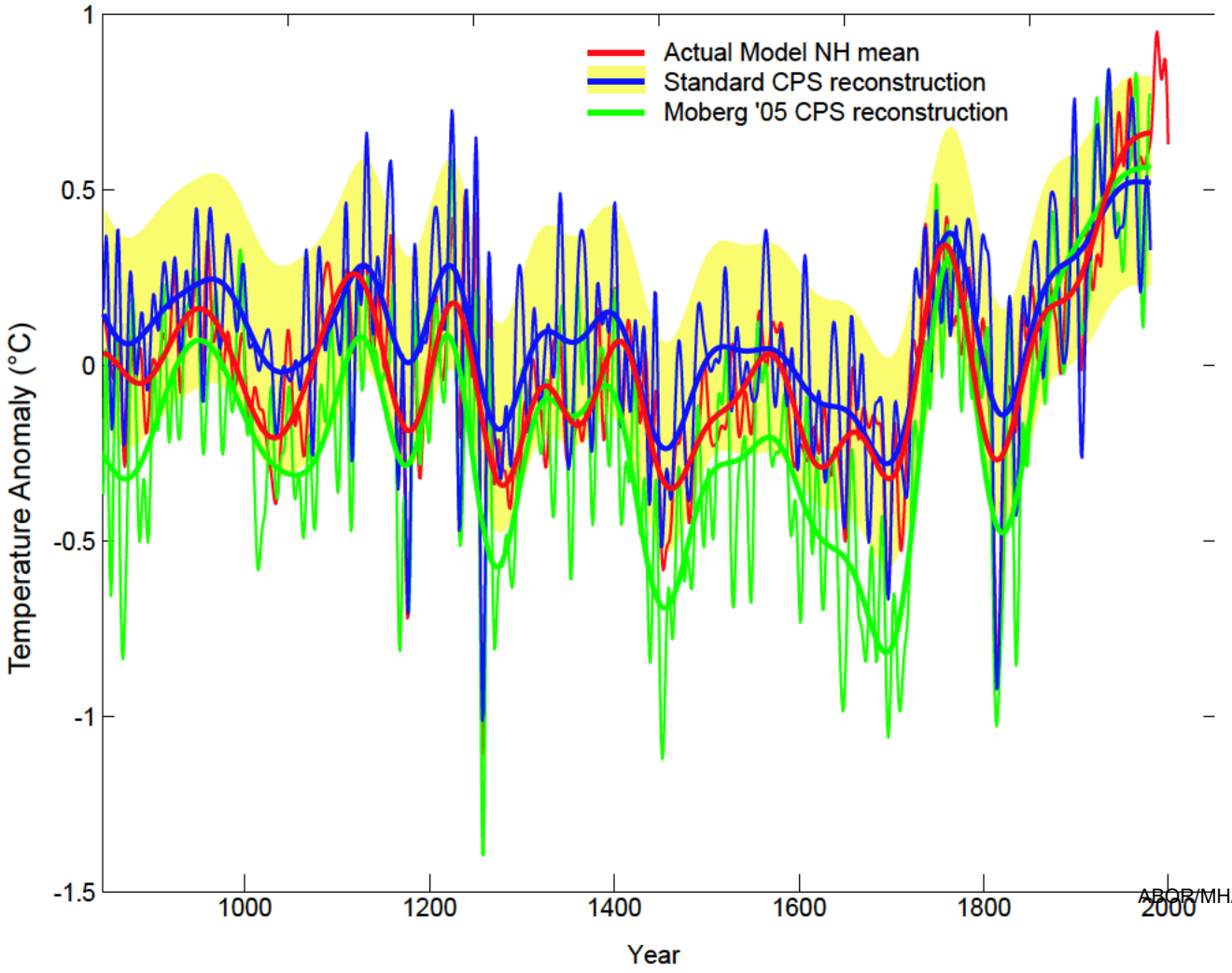

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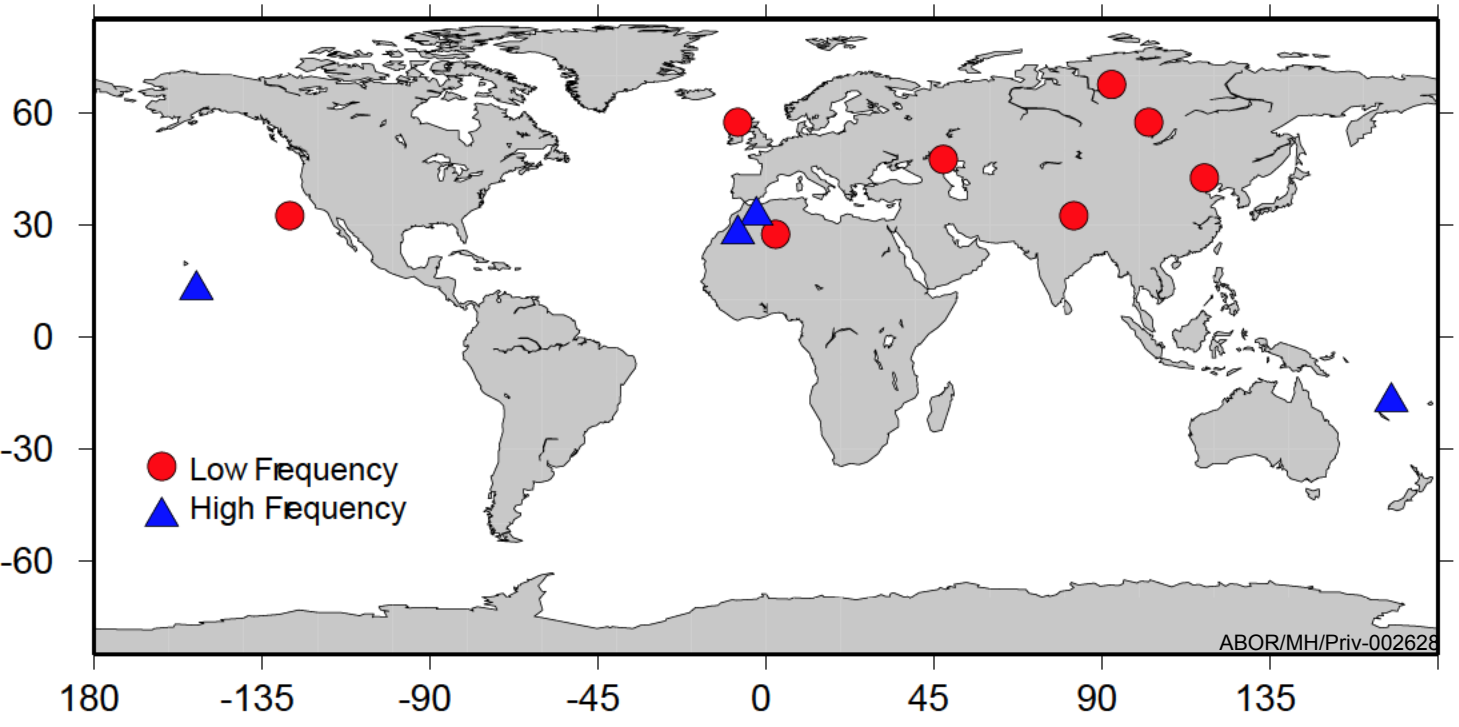

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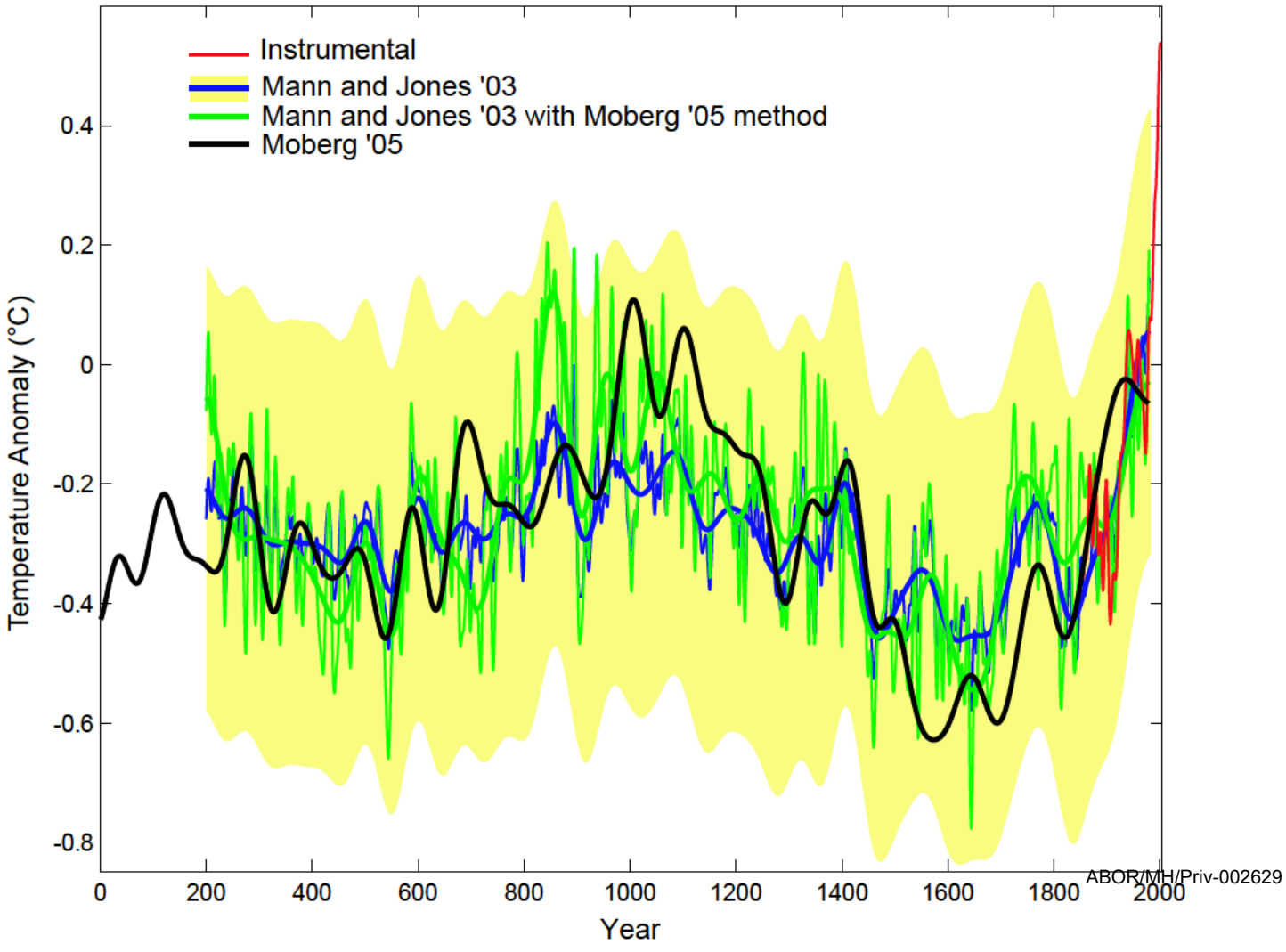

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From: Michael E. Mann
To: Malcolm Hughes; Scott Rutherford; fenbiao@ltrr.arizona.edu; Raymond Bradley
Subject: Re: some more data questions
Date: Friday, February 11, 2005 5:19:16 PM

HI Malcolm,

Sounds good.

Only comment is that we do, of course, want to make use of any conservatively standardized tree-ring series for both low and high-frequencies. We should, however, have a standard for minimum replication, so that should be included in the metadatafile....

Mike

At 06:33 PM 2/11/2005, Malcolm Hughes wrote:

> Gentlemen - I seek you approval of the following:
> 1. On reflection, I think we could/should omit the 60 "Soviet" tree-ring width series we got from Vaganov. We included them in 1997 because we did not have access to the Schweingruber data and so had nothing else up there. It's a pretty good dataset, but we are missing some specific information about it. They were cored from the same tree-line trees as the Schweingruber density data. This does not apply to many of the Vaganov/Shishov data from the rest of Siberia, so leave them in. OK?
>
> 2. Back in 2002/2003 when we were discussing strategy for this exercise, we saw the ITRDB tree rings as almost exclusively a high-frequency source. As a result, we only required 8 trees as far back as 1800, thus including a huge mass of data for the 19th (and 18th) centuries. OK. The problem comes as we step back further -by the time we get to the 15th and 16th centuries we may be including really poorly replicated series. This of course, becomes very hairy the further back we go.What I suggest is that we include 1(2) more column(s) in Scott's metadatafile containing for each (non-Osborn) tree-ring based chronology the first year in which it is based on 5(10) series. In this way, you could avoid using the early, really poorly replicated, very dangerous parts of any of the tree-ring series. This make sense?
> Cheers, Malcolm

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From: Michael E. Mann
To: Malcolm Hughes; Scott Rutherford
Cc: Bradley Raymond; Zhihua Zhang; Frank Keimig; Tim Cook; fenbiao@ltrr.arizona.edu; Anderson Justin; mann@virginia.edu
Subject: Re: Ice core data inventory
Date: Thursday, February 03, 2005 6:50:03 PM

Hi Malcolm,

Thanks--I concur fully on issues #1 and #2...

Regarding issue #3, I think we should remove the redundant chronologies from the ITRDB for which we have more conservatively standardized versions. What do others thing?

mike

At 07:22 PM 2/3/2005, Malcolm Hughes wrote:

> Gentlemen - in clearing up redundancies in the tree-ring part of the dataset some general issues arise on which decisions need to be made. I think we are already clear that the only density data to include, other than the Osborn gridded set, are those contributed by others and not included in the original Schweingruber set from which the Osborn is derived. That's easy.
> The second thing that I think is easy is that there are a number of locations for which more than one tree-ring chronology is included because more than one variable was used, for example ring-width and maximum density chronologies from the same places in Kashmir submitted by me. The Stahle set including ring width, earlywood width and latewood width falls into the same category. Although they may be well correlated, they are not redundant, so I think they should all stay in.
> The third issue may be more difficult. A number of authors have gone to great trouble to produce tree-ring chronologies, for example using RCS, retaining as much centenniial-scale variation as possible. This would apply, for example, to the reworked set Ricardo Villalba gave us in 98. It seems to me that these are very important to our objectives (especially for the pre AD 1000 part) and should be included. My question is, however, whether to also include the less conservatively standardized versions of hte same chronologies that we may have picked up in our search of the ITRDB, or to go in and remove those?
> CHeers, Malcolm

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From: Michael E. Mann
To: raymond s. bradley; srutherford@rwu.edu; mhughes@ltrr.arizona.edu; zz9t@virginia.edu
Cc: frank@geo.umass.edu; mann@virginia.edu
Subject: Re: Ice core data inventory
Date: Tuesday, February 01, 2005 9:07:51 AM

Dear All,

This should complete the data for our initial revised reconstructions. We can always add in more proxy data towards the final stages, and redo the reconstructions.

But I suggest we now "freeze" the proxy data set based on what has now been received.

Scott, Zhang: Can you go through, make sure there are no data problems (missing values, obvious outliers, etc.), add any metadata necessary to include in the reconstructions, marking those data taht should only be used in decadal band, etc.

Then, pending resolution w/ Malcolm on ITRDB data, we should proceed immediately with the new reconstructions.

Scott should have the Monte Carlo procedure working shortly (Scott-any updates on this?).

Thanks,

Mike

At 11:00 AM 2/1/2005, raymond s. bradley wrote:

> I attach the ice core data inventory. This includes a number of files from Dave Fisher that are not available elsewhere, plus some other records (GISP2 accumulation, Vostok del 18O) that are also otherwise unavailable.
>
> This completes the non-tree-ring data sets that I have compiled. I will continue to dig around for more data, and distribute additional files as these become available.
>
> You should all now have data inventories, & associated data files, for:
>
> ice cores
> historical documentary records
> lake sediments
> speleothems
> corals
> ...& of course, tree rings.
>
> I have tried to be careful in putting these files together, but there may be still some errors (M&M, please note...). If anybody sees something that looks strange, let me know right away & I'll try to correct the problem.
>
> I will ask Tim Cook here to compile new maps on the non-tree ring data

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distribution and circulate these asap.

I'll be away Feb 2-14 & 2/16-18..with intermittent email contact.
Ray

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From: Michael E. Mann
To: raymond s. bradley; srutherford@rwu.edu; mhughes@ltrr.arizona.edu; zz9t@virginia.edu
Cc: drdendro@ldeo.columbia.edu; frank@geo.umass.edu
Subject: Re: Ice core data inventory
Date: Tuesday, February 01, 2005 9:03:28 AM

HI Ray,

Thanks--not sure why you sent this to Ed Cook. I think you meant to send to Tim Cook?

Sorry Ed!

mike

At 11:00 AM 2/1/2005, raymond s. bradley wrote:

> I attach the ice core data inventory. This includes a number of files from Dave Fisher that are not available elsewhere, plus some other records (GISP2 accumulation, Vostok del 18O) that are also otherwise unavailable.
>
> This completes the non-tree-ring data sets that I have compiled. I will continue to dig around for more data, and distribute additional files as these become available.
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> corals
> ...& of course, tree rings.
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>
> I will ask Tim Cook here to compile new maps on the non-tree ring data distribution and circulate these asap.
>
> I'll be away Feb 2-14 & 2/16-18..with intermittent email contact.
> Ray
>
> **Raymond S. Bradley**
> Director, **Climate System Research Center***
> **Department of Geosciences, University of Massachusetts**
> **Morrill Science Center**
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From: raymond s. bradley
To: srutherford@rwu.edu; mann@multiproxy.evsc.virginia.edu; mhughes@ltrr.arizona.edu; zz9t@virginia.edu
Cc: drdendro@ldeo.columbia.edu; frank@geo.umass.edu
Subject: Ice core data inventory
Date: Tuesday, February 01, 2005 9:01:22 AM
Attachments: Ice core data inventory 2005.xls

I attach the ice core data inventory. This includes a number of files from Dave Fisher that are not available elsewhere, plus some other records (GISP2 accumulation, Vostok del 18O) that are also otherwise unavailable.

This completes the non-tree-ring data sets that I have compiled. I will continue to dig around for more data, and distribute additional files as these become available.

You should all now have data inventories, & associated data files, for:

ice cores
historical documentary records
lake sediments
speleothems
corals
...& of course, tree rings.

I have tried to be careful in putting these files together, but there may be still some errors (M&M, please note...). If anybody sees something that looks strange, let me know right away & I'll try to correct the problem.

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KEY to COLUMN E

Ice	8001 = O-18
	8002 = deuterium
	8003 = accumulation
	8004 = melt %
	8005 = other (dust, gases etc)
	8006= derived parameter (PC, or other index)

Mann et al 1998 used:

Greenland	Ice melt	summer air temp	66N	45W	1545	Kameda et al, 1996
Svalbard	Ice melt	summer air temp	79N	17W	1400	Tarussov 1992
Penny	Ice O-18	(temp)	70N	70W	1718	Fisher et al 1998
Central Greenland (Stack)	Ice O-18	(temp)	77N	60W	553	Fisher et al 1996
Quelccaya summit core	Ice O-18	(air temp)	14S	71W	470	Thompson 1982
Quelccaya summit core	Ice accumulation	precip	"	"	488	"
Quelccaya Core 2	Ice O-18	(air temp)	"	"	744	"
Quelccaya Core 2	Ice accumulation	precip	"	"	744	"

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1971	-5.64	1961	2.721	1985.499	94		1972	-1.357	1973	2907	1971	16.8	1982	-0.418	1970	-23.5096
1970	-4.3665	1956	3.038	1983.994	100		1971	0.445	1972	2911	1966	18.8	1981	-0.482	1969	-24.313
1969	2.3865	1951	1.611	1982.485	100		1970	0.125	1971	2782	1961	21.06	1980	-0.415	1968	-22.6863
1968	-1.464	1946	1.209	1980.972	75		1969	0.255	1970	2650	1956	24.72	1979	-1.674	1967	-24.3011
1967	-2.499	1941	2.156	1979.454	26		1968	0.465	1969	2719	1951	17.61	1978	0.602	1966	-24.8912
1966	-2.4345	1936	4.495	1977.933	60		1967	-0.568	1968	3100	1946	5.91	1977	1.614	1965	-24.0107
1965	-0.4005	1931	1.794	1976.407	71		1966	-0.769	1967	2950	1941	8.83	1976	0.658	1964	-23.4773
1964	-0.6105	1926	0.914	1974.878	100		1965	0.258	1966	2722	1936	9.23	1975	0.246	1963	-25.6888
1963	-2.3234	1921	0.832	1973.344	91		1964	-0.994	1965	2688	1931	23.81	1974	0.081	1962	-24.4631
1962	-3.6105	1916	1.077	1971.806	100		1963	-0.957	1964	2706	1926	19.75	1973	-0.169	1961	-23.0196
1961	-5.282	1911	1.012	1970.264	100		1962	-0.567	1963	2729	1921	10.19	1972	-0.373	1960	-23.556
1960	-5.855	1906	1.795	1968.717	100		1961	-0.089	1962	2771	1916	11.94	1971	-0.381	1959	-23.2763
1959	-7.295	1901	0.715	1967.167	100		1960	0.864	1961	2740	1911	7.61	1970	-0.109	1958	-23.5929
1958	-6.429	1896	-0.176	1965.612	100		1959	-0.545	1960	2896	1906	6.4	1969	0.239	1957	-23.0596
1957	-6.964	1891	-0.247	1964.053	97		1958	-0.685	1959	2753	1901	8.97	1968	0.781	1956	-23.8126
1956	-6.351	1886	0.654	1962.49	37		1957	-0.275	1958	2684	1896	10.69	1967	-0.199	1955	-23.172
1955	-5.922	1881	1.024	1960.922	82		1956	-0.608	1957	2541	1891	8	1966	0.399	1954	-24.5723
1954	-2.55	1876	0.877	1959.35	81		1955	-0.209	1956	2699	1886	8.02	1965	0.855	1953	-23.9662
1953	-2.404	1871	2.028	1957.774	100		1954	-0.005	1955	2850	1881	7.31	1964	1.019	1952	-24.6786
1952	-2.435	1866	0.17	1956.194	75		1953	-0.21	1954	2793	1876	13.39	1963	0.335	1951	-24.5105
1951	-1.526	1861	0.475	1954.609	81		1952	0.251	1953	2801	1871	11.05	1962	0.347	1950	-24.7239
1950	-0.221	1856	-0.227	1953.019	100		1951	-0.401	1952	2707	1866	8.63	1961	0.651	1949	-24.6144
1949	0.323	1851	0.224	1951.426	77		1950	-1.425	1951	2702	1861	8.96	1960	0.008	1948	-23.9863
1948	1.076	1846	-0.459	1949.828	100		1949	-1.053	1950	2626	1856	9.53	1959	0.736	1947	-23.987
1947	1.501	1841	-0.357	1948.225	37		1948	0.127	1949	2674	1851	7.87	1958	-0.175	1946	-24.6633
1946	1.744	1836	-0.161	1946.619	38		1947	0.056	1948	2743	1846	3.34	1957	-1.138	1945	-25.5653
1945	0.589	1831	-0.184	1945.007	27		1946	1.125	1947	2650	1841	3.27	1956	-0.447	1944	-25.201
1944	0.445	1826	-0.339	1943.391	100		1945	0.629	1946	2697	1836	3.39	1955	-0.138	1943	-25.4229
1943	-1.895	1821	-0.198	1941.771	93		1944	-0.626	1945	2698	1831	3.35	1954	-0.272	1942	-25.2679

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2	
1992	92.9664
1991	47.9194
1990	21.9141
1989	40.6818
1988	64.9196
1987	124.9296
1986	78.875
1985	20.7219
1984	43.3371
1983	22.0658
1982	40.5861
1981	35.5733
1980	3.5976
1979	40.3557
1978	33.509
1977	12.6134
1976	30.6641
1975	83.2648
1974	23.5785
1973	13.1359
1972	44.5998
1971	61.5169
1970	57.1726
1969	22.4167
1968	80.1001
1967	45.9719
1966	9.9629
1965	40.5406
1964	107.7721

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp	
1992	44.4792
1991	62.5768
1990	55.9624
1989	51.7287
1988	39.3125
1987	26.9923
1986	30.5221
1985	34.3026
1984	24.9611
1983	36.6259
1982	27.8089
1981	15.5919
1980	31.7976
1979	25.0735
1978	35.3064
1977	32.3278
1976	56.5204
1975	40.362
1974	46.0031
1973	57.3903
1972	33.7742
1971	25.4983
1970	33.2736
1969	37.4955
1968	36.6398
1967	45.9995
1966	17.2957
1965	48.2466
1964	39.5118

Fisher, D.A., 2002 - S. Greenland

sgreenpc	
1970	10.43
1969	10.28
1968	10.14
1967	9.82
1966	9.96
1965	10.42
1964	10.27
1963	10.1
1962	10.52
1961	10.66
1960	10.53
1959	10.39
1958	10.54
1957	10.6
1956	10.07
1955	8.93
1954	9.15
1953	9.61
1952	10.07
1951	10.36
1950	10.58
1949	10.78
1948	10.87
1947	10.86
1946	10.29
1945	10.02
1944	10.22
1943	10.05
1942	9.23

Fisher, D.A., 2004 - S. Greenland

del1dye2	
1974	-25.69
1973	-25.96
1972	-26.97
1971	-25.05
1970	-25.38
1969	-26.08
1968	-24.78
1967	-25.29
1966	-26.41
1965	-24.01
1964	-25.84
1963	-25.88
1962	-26.92
1961	-25.53
1960	-24.41
1959	-24.12
1958	-26.31
1957	-26.81
1956	-26.27
1955	-25.28
1954	-24.4
1953	-24.93
1952	-25.04
1951	-26.43
1950	-25.66
1949	-27.17
1948	-26.51
1947	-25.89
1946	-25.14

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)
2000	0.7	
1999	0.73	
1998	0.58	
1997	0.59	
1996	0.56	
1995	0.45	
1994	0.69	
1993	0.54	
1992	0.37	
1991	0.48	
1990	0.6	
1989	0.36	
1988		
1987	0.51	-33.2
1986	0.76	-31.1
1985	0.49	-30.5
1984	0.41	-33.5
1983	0.32	-30.7
1982	0.33	-31.2
1981	0.68	-25.5
1980	0.39	-31.3
1979	0.38	-32.2
1978	0.4	-31.3
1977	0.21	-34.5
1976	0.39	-34
1975	0.27	-34.8
1974	0.42	-35.8
1973	0.52	-28.2
1972	0.29	-32.9

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1984	-19.93	1.521
1983	-13.92	1.1205
1982	-19.22	1.649
1981	-17.435	1.389
1980	-16.005	1.596
1979	-17.375	1.6675
1978	-17.27	1.0605
1977	-17.94	1.0235
1976	-17.865	1.2445
1975	-18.745	1.31
1974	-19.75	1.5855
1973	-19.625	1.1395
1972	-19.01	1.24
1971	-18.815	1.69
1970	-18.965	1.162
1969	-16.315	1.641
1968	-15.39	1.016
1967	-16.07	1.3875
1966	-16.11	1.523
1965	-16.285	1.6815
1964	-16.545	1.711
1963	-17.01	1.4305
1962	-18.055	1.772
1961	-17.96	1.2465
1960	-17.615	1.586
1959	-17.79	1.3215
1958	-15.905	1.4755
1957	-15.915	1.502
1956	-16.52	1.501

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18
2000	-16.55
1990	-17.70
1980	-18.48
1970	-16.75
1960	-17.93
1950	-16.86
1940	-17.21
1930	-17.71
1920	-17.90
1910	-17.42
1900	-18.74
1890	-18.05
1880	-18.89
1870	-18.50
1860	-18.26
1850	-17.87
1840	-18.30
1830	-18.10
1820	-20.00
1810	-18.57
1800	-18.41
1790	-18.94
1780	-18.72
1770	-18.67
1760	-19.35
1750	-18.61
1740	-19.38
1730	-17.85
1720	-18.54

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18
1987	-10.09
1980	-10.33
1970	-10.39
1960	-9.74
1950	-9.22
1940	-9.43
1930	-9.85
1920	-9.74
1910	-10.86
1900	-10.16
1890	-9.89
1880	-11.63
1870	-10.00
1860	-10.08
1850	-10.56
1840	-10.24
1830	-10.77
1820	-10.70
1810	-10.19
1800	-10.60
1790	-11.38
1780	-11.63
1770	-10.82
1760	-10.19
1750	-10.60
1740	-10.51
1730	-10.43
1720	-9.74
1710	-9.75

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years A.D.
1989	-12.35	1997	-17.34	1995	-15.87	1997	-16.91	1950	-9.335	2000	-147.472	1970	-22.422	1970	-20.37	1970	-25.02	1970	-55.3449	1996
1979	-13.75	1990	-18.58	1990	-17.32	1990	-17.20	1940	-9.605	1999	-147.023	1969	-22.229	1969	-20.9	1969	-25.28	1969	-55.4754	1995
1969	-12.63	1980	-17.67	1980	-18.20	1980	-18.72	1930	-9.42	1998	-147.023	1968	-21.786	1968	-21.15	1968	-25.72	1968	-55.4969	1994
1959	-13.74	1970	-17.97	1970	-16.46	1970	-16.40	1920	-9.005	1997	-146.392	1967	-21.917	1967	-18.14	1967	-24.83	1967	-55.69	1993
1949	-12.78	1960	-17.91	1960	-17.88	1960	-16.39	1910	-9.575	1996	-147.199	1966	-22.908	1966	-21.74	1966	-26.67	1966	-55.69	1992
1939	-13.46	1950	-17.14	1950	-17.18	1950	-15.41	1900	-10.415	1995	-147.782	1965	-20.465	1965	-20.09	1965	-25.6	1965	-55.5254	1991
1929	-13.29	1940	-18.41	1940	-16.93	1940	-16.92	1890	-10.145	1994	-148.375	1964	-21.136	1964	-18.5	1964	-25.23	1964	-55.0222	1990
1919	-14.22	1930	-19.01	1930	-17.39	1930	-17.88	1880	-9.32	1993	-148.491	1963	-21.883	1963	-19.01	1963	-26.27	1963	-55.0222	1989
1909	-14.18	1920	-19.78	1920	-18.10	1920	-17.82	1870	-10.075	1992	-148.693	1962	-22.308	1962	-20.84	1962	-24.6	1962	-55.0222	1988
1899	-14.10	1910	-18.58	1910	-17.84	1910	-16.13	1860	-8.775	1991	-149.373	1961	-20.984	1961	-22.65	1961	-26.79	1961	-54.6101	1987
1889	-12.28	1900	-20.24	1900	-18.99	1900	-17.97	1850	-8.085	1990	-149.558	1960	-22.041	1960	-19.36	1960	-24.68	1960	-54.5673	1986
1879	-15.86	1890	-18.65	1890	-17.19	1890	-16.86	1840	-8.215	1989	-148.443	1959	-22.448	1959	-21.14	1959	-25.9	1959	-54.3968	1985
1869	-14.77	1880	-18.65	1880	-16.50	1880	-19.51	1830	-8.595	1988	-148.443	1958	-21.595	1958	-20.7	1958	-24.77	1958	-54.3159	1984
1859	-15.29	1870	-20.20	1870	-17.49	1870	-17.82	1820	-9.335	1987	-147.58	1957	-20.593	1957	-20.24	1957	-25.11	1957	-54.173	1983
1849	-14.75	1860	-18.98	1860	-17.87	1860	-17.06	1810	-9.125	1986	-147.247	1956	-20.266	1956	-20.72	1956	-25.81	1956	-54.1231	1982
1839	-17.14	1850	-19.72	1850	-17.96	1850	-16.35	1800	-9.215	1985	-146.536	1955	-21.498	1955	-21.81	1955	-24.74	1955	-54.1231	1981
1829	-14.38	1840	-19.97	1840	-17.29	1840	-16.06	1790	-9.965	1984	-145.967	1954	-21.789	1954	-20.97	1954	-25.57	1954	-54.0584	1980
1819	-13.59	1830	-19.35	1830	-16.64	1830	-19.77	1780	-12	1983	-145.967	1953	-21.346	1953	-20.64	1953	-26.33	1953	-54.0577	1979
1809	-17.83	1820	-20.67	1820	-18.18	1820	-18.71	1770	-10.825	1982	-146.527	1952	-22.402	1952	-19.29	1952	-24.83	1952	-54.0577	1978
1799	-15.17	1810	-19.63	1810	-17.13	1810	-17.48	1760	-10.725	1981	-146.887	1951	-20.993	1951	-19.76	1951	-25.77	1951	-54.0577	1977
1789	-14.39	1800	-18.67	1800	-16.41	1800	-15.13	1750	-11.53	1980	-146.887	1950	-21.262	1950	-20.04	1950	-26.88	1950	-54.0577	1976
1779	-13.96	1790	-21.52	1790	-16.71	1790	-16.90	1740	-11.59	1979	-147.464	1949	-22.07	1949	-21.08	1949	-26.54	1949	-54.056	1975
1769	-14.86	1780	-21.04	1780	-18.46	1780	-17.23	1730	-10.135	1978	-148.148	1948	-22.06	1948	-21.38	1948	-26.22	1948	-54.0506	1974
1759	-15.60	1770	-21.08	1770	-17.23	1770	-18.22	1720	-9.775	1977	-148.424	1947	-22.311	1947	-20.47	1947	-25.8	1947	-54.0506	1973
1749	-15.16	1760	-19.63	1760	-18.33	1760	-16.59	1710	-9.155	1976	-149.01	1946	-21.396	1946	-18.14	1946	-24.19	1946	-54.0506	1972
1739	-13.24	1750	-19.29	1750	-18.14	1750	-18.32	1700	-8.71	1975	-149.01	1945	-22.163	1945	-22.12	1945	-25.22	1945	-54.0506	1971
1729	-14.92	1740	-21.99	1740	-19.34	1740	-18.60	1690	-8.5	1974	-148.417	1944	-21.484	1944	-20.93	1944	-24.27	1944	-54.0506	1970
1719	-15.11	1730	-19.77	1730	-20.06	1730	-17.20	1680	-8.795	1973	-147.841	1943	-22.033	1943	-19.95	1943	-25.33	1943	-54.0788	1969
1709	-15.60	1720	-20.68	1720	-19.57	1720	-18.35	1670	-9.48	1972	-146.66	1942	-22.21	1942	-20.09	1942	-25.34	1942	-54.1298	1968

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
-319.4	1970	-29.7008	1994	-440.0	1.6	1987	0.19598	2000	-35.19	1970	1.569
-303.1	1969	-29.7051	1993	-439.4	1.7	1986	0.30087	1950	-34.83	1969	1.111
-297.6	1968	-29.8336	1992	-436.2	1.7	1985	0.19773	1900	-35.05	1968	-1.759
-298.8	1967	-29.8336	1991	-435.9	1.7	1984	0.27362	1850	-35.45	1967	-1.098
-263.8	1966	-29.8336	1990	-435.2	1.7	1983	0.30368	1800	-35.42	1966	0.278
-293.9	1965	-29.93	1989	-433.2	1.9	1982	0.20231	1750	-35.63	1965	0.353
-279.3	1964	-29.9376	1988	-433.0	2.1	1981	0.14836	1700	-35.8	1964	1.139
-285.5	1963	-29.9828	1987	-432.5	2.1	1980	0.23168	1650	-35.62	1963	1.368
-288.2	1962	-30.1393	1986	-433.4	2.3	1979	0.26875	1600	-35.48	1962	0.035
-264.6	1961	-30.1393	1985	-433.3	2.3	1978	0.17544	1550	-35.36	1961	0.372
-272.1	1960	-30.1393	1984	-432.3	2.4	1977	0.28773	1500	-35.41	1960	0.96
-286.2	1959	-30.1736	1983	-431.5	2.4	1976	0.28867	1450	-35.1	1959	0.378
-299.3	1958	-30.1975	1982	-430.1	2.4	1975	0.25925	1400	-35.27	1958	0.943
-293.2	1957	-30.1975	1981	-430.5	2.4	1974	0.23824	1350	-35.67	1957	-0.648
-273.8	1956	-30.1982	1980	-430.6	2.5	1973	0.13515	1300	-35.33	1956	0.952
-294.9	1955	-30.1842	1979	-431.5	2.5	1972	0.20761	1250	-35.38	1955	-0.157
-289.5	1954	-30.062	1978	-433.6	2.4	1971	0.26715	1200	-35.63	1954	0.651
-301.4	1953	-30.062	1977	-432.2	2.3	1970	0.20775	1150	-35.49	1953	0.485
-288.7	1952	-29.9991	1976	-431.7	2.4	1969	0.23643	1100	-35.3	1952	-0.472
-295.5	1951	-29.9315	1975	-430.4	2.5	1968	0.23374	1050	-35.66	1951	0.432
-295	1950	-29.9315	1974	-429.4	2.4	1967	0.22544	1000	-35.01	1950	-0.336
-319.7	1949	-29.8193	1973	-429.5	2.3	1966	0.23318	950	-35.09	1949	-0.677
-317.6	1948	-29.8013	1972	-431.5	2.3	1965	0.1583	900	-35.58	1948	0.122
-287.8	1947	-29.8013	1971	-433.9	2.3	1964	0.23702	850	-35.51	1947	2.457
-271.7	1946	-29.6994	1970	-435.3	2.3	1963	0.25048	800	-35.34	1946	1.525
-294.7	1945	-29.6194	1969	-436.4	2.2	1962	0.2473	750	-35.27	1945	0.217
-302.2	1944	-29.6194	1968	-436.9	2.2	1961	0.24952	700	-35.26	1944	-0.134
-294.7	1943	-29.5727	1967	-437.9	2.2	1960	0.17692	650	-35.09	1943	-0.345
-272	1942	-29.5691	1966	-440.8	2.1	1959	0.28236	600	-35.2	1942	0.178

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1942	-4.255	1816	-0.171	1940.146	79			1943	-0.639	1944	2704	1826	3.3	1953	0.826	1941	-24.1934
1941	-3.603	1811	-0.187	1938.517	84			1942	-0.084	1943	2836	1821	3.17	1952	0.634	1940	-26.036
1940	-3.234	1806	-0.42	1936.883	64	100	82	1941	0.129	1942	2944	1816	4.88	1951	0.048	1939	-23.867
1939	-2.853	1801	-0.492	1935.245	100	100	100	1940	0.416	1941	2743	1811	3.86	1950	-0.3	1938	-24.0311
1938	-3.035	1796	-0.464	1933.602	82	100	91	1939	1.485	1940	2692	1806	4.18	1949	-1.353	1937	-23.33
1937	-4.047	1791	-0.002	1931.954	52	100	76	1938	-0.165	1939	2727	1801	4.2	1948	-0.197	1936	-25.7115
1936	-3.753	1786	0.074	1930.302	100	100	100	1937	-0.888	1938	2804	1796	5.24	1947	0.996	1935	-24.3094
1935	-2.223	1781	0.06	1928.645	100	100	100	1936	0.344	1937	2772	1791	7.93	1946	1.157	1934	-24.4617
1934	-1.426	1776	0.104	1926.984	81	100	90.5	1935	1.052	1936	2602	1786	14.74	1945	1.175	1933	-23.2688
1933	-1.931	1771	-0.322	1925.318	100	100	100	1934	0.575	1935	2690	1781	9.81	1944	-0.387	1932	-22.9292
1932	-1.531	1766	-0.453	1923.647	100	95	97.5	1933	0.872	1934	2816	1776	8.32	1943	-0.851	1931	-22.5162
1931	1.585	1761	-0.509	1921.971	95.5	100	97.75	1932	0.491	1933	2733	1771	6.84	1942	0.871	1930	-22.7373
1930	0.731	1756	-0.562	1920.291	100	97	98.5	1931	-0.065	1932	2730	1766	5.37	1941	1.356	1929	-22.4152
1929	-0.841	1751	-0.056	1918.606	100	99	99.5	1930	0.105	1931	2785	1761	3.74	1940	0.018	1928	-22.5007
1928	-1.434	1746	-0.326	1916.917	100	94	97	1929	1.358	1930	2727	1756	6.21	1939	1.233	1927	-23.249
1927	-0.968	1741	-0.295	1915.222	75	94	84.5	1928	2.346	1929	2723	1751	6.14	1938	-0.297	1926	-22.4997
1926	0.896	1736	-0.138	1913.523	74	81	77.5	1927	0.756	1928	2567	1746	4.39	1937	-1.052	1925	-23.5307
1925	1.644	1731	-0.305	1911.819	100	99	99.5	1926	0.716	1927	2549	1741	8.97	1936	0.496	1924	-24.1799
1924	1.619	1726	-0.294	1910.11	73	85	79	1925	-0.835	1926	2662	1736	8.89	1935	0.64	1923	-23.53
1923	0.135	1721	-0.309	1908.396	100	100	100	1924	-1.228	1925	2727	1731	9.28	1934	1.217	1922	-23.721
1922	-0.073	1716	-0.304	1906.677	44	100	72	1923	0.635	1924	2718	1726	4.2	1933	0.897	1921	-25.4473
1921	-1.417	1711	0.024	1904.953	82	100	91	1922	-0.303	1923	2767	1721	2.77	1932	1.817	1920	-24.7698
1920	-0.678	1706	-0.375	1903.225	62	99	80.5	1921	-0.278	1922	2766	1716	2.83	1931	0.876	1919	-24.8764
1919	-0.657	1701	-0.552	1901.492	54	90	72	1920	0.069	1921	2790	1711	4.66	1930	0.454	1918	-23.7288
1918	-0.536	1696	-0.593	1899.753	73	45	59	1919	0.49	1920	2767	1706	5.03	1929	1.388	1917	-24.8085
1917	-0.146	1691	-0.446	1898.01	70	61	65.5	1918	-0.81	1919	2709	1701	6.33	1928	0.64	1916	-23.7471
1916	0.236	1686	-0.504	1896.261	13	91	52	1917	0.223	1918	2739	1696	5.42	1927	0.093	1915	-23.9323
1915	0.041	1681	-0.289	1894.508	62	25	43.5	1916	1.317	1917	2773	1691	4.69	1926	-0.495	1914	-22.8698
1914	-1.055	1676	-0.51	1892.75	100	10	55	1915	0.463	1916	2724	1686	1.56	1925	-0.34	1913	-24.4703

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island			Fisher et al., 1998 - Penny Ice Cap, Baffin Island		Fisher, D.A., 2002 - S. Greenland		Fisher, D.A., 2004 - S. Greenland		Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2			pc25yrsp		sgreenpc		del1dye2		Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
1963	10.0757		1963	22.9507	1941	8.77	1945	-25.58	1971	0.2	-27.9	1955	-18.46	1.243	1710	-18.82	1700	-10.02
1962	73.2985		1962	39.8161	1940	8.86	1944	-27.18	1970	0.15	-26.3	1954	-18.38	1.71	1700	-18.87	1690	-10.22
1961	61.2058		1961	36.0018	1939	9.39	1943	-25.34	1969	0.41	-31.5	1953	-19.23	1.264	1690	-18.73	1680	-11.56
1960	42.7099		1960	39.0918	1938	9.66	1942	-26.03	1968	0.49	-34.6	1952	-17.505	1.2085	1680	-19.19	1670	-11.47
1959	80.0996		1959	46.1064	1937	9.92	1941	-24.78	1967	0.24	-31.6	1951	-18.42	1.388	1670	-19.36	1660	-12.18
1958	60.6297		1958	43.6828	1936	10.1	1940	-25.43	1966	0.3	-35	1950	-18.84	1.747	1660	-17.75	1650	-11.98
1957	74.6411		1957	25.3802	1935	10.24	1939	-27.57	1965	0.46	-33.8	1949	-18.065	1.688	1650	-18.48	1640	-10.44
1956	108.2853		1956	52.4782	1934	10.15	1938	-26.56	1964	0.3	-34.3	1948	-17.89	1.3045	1640	-18.21	1630	-11.18
1955	78.6485		1955	41.8218	1933	9.87	1937	-26.53	1963	0.55	-33	1947	-16.85	1.585	1630	-18.97	1620	-12.40
1954	28.5258		1954	54.839	1932	9.68	1936	-25.2	1962	0.43	-36.1	1946	-18.335	1.6785	1620	-18.54	1610	-10.83
1953	108.6844		1953	43.8948	1931	9.85	1935	-26.25	1961	0.57	-32.6	1945	-18.315	1.604	1610	-18.95	1600	-10.61
1952	109.4804		1952	15.0798	1930	10.25	1934	-26.5	1960	0.53	-31.8	1944	-15.5	1.3875	1600	-17.79	1590	-11.15
1951	105.1514		1951	43.0899	1929	10.44	1933	-26.72	1959	0.45	-35.4	1943	-17.39	1.4495	1590	-18.28	1580	-10.24
1950	52.2737		1950	51.0867	1928	10.61	1932	-23.23	1958	0.69	-33.4	1942	-15.565	1.469	1580	-19.16	1570	-10.15
1949	36.0694		1949	44.0369	1927	10.57	1931	-25.66	1957	0.37	-35.4	1941	-16.32	0.8035	1570	-18.50	1560	-11.13
1948	22.92		1948	39.2808	1926	10.4	1930	-27	1956	0.32	-31.9	1940	-14.465	1.269	1560	-18.37	1550	-10.20
1947	79.837		1947	42.0689	1925	10.19	1929	-25.02	1955	0.38	-28.2	1939	-14.86	1.434	1550	-18.66	1540	-11.56
1946	46.7764		1946	32.0651	1924	9.82	1928	-26.23	1954	0.47	-33.5	1938	-15.79	1.2765	1540	-17.57	1530	-10.80
1945	35.9835		1945	26.5386	1923	10.12	1927	-25.74	1953	0.38	-34.2	1937	-15.655	1.4125	1530	-17.24	1520	-10.06
1944	53.8478		1944	43.3287	1922	10.32	1926	-27.09	1952	0.42	-29.7	1936	-15.535	1.258	1520	-18.36	1510	-11.73
1943	75.1606		1943	38.9313	1921	10.28	1925	-26.51	1951	0.3	-28	1935	-16.245	1.3985	1510	-18.05	1500	-10.48
1942	84.7382		1942	48.9221	1920	10.18	1924	-25.49	1950	0.43	-34.5	1934	-17.795	1.5295	1500	-17.71	1490	-10.93
1941	58.3637		1941	40.0811	1919	10.03	1923	-26.23	1949	0.5	-31.2	1933	-18.47	1.5335	1490	-17.71	1480	-11.56
1940	75.8428		1940	27.4226	1918	9.67	1922	-27.6	1948	0.33	-33.9	1932	-18.87	1.5205	1480	-18.49	1470	-11.29
1939	54.0615		1939	29.0142	1917	9.98	1921	-27.29	1947	0.3	-34.6	1931	-19.14	2.0025	1470	-18.14	1460	-11.06
1938	17.5236		1938	25.646	1916	10.47	1920	-26.8	1946	0.26	-31.8	1930	-17.42	1.3925	1460	-18.47	1450	-11.20
1937	7.3588		1937	25.0501	1915	10.06	1919	-26.72	1945	0.4	-34.5	1929	-17.94	1.5225	1450	-17.47	1440	-10.69
1936	23.6559		1936	44.4276	1914	9.62	1918	-27.84	1944	0.32	-34.1	1928	-17.085	1.7735	1440	-18.42	1430	-12.41
1935	14.2622		1935	39.191	1913	9.57	1917	-25.5	1943	0.37	-34.3	1927	-17.535	1.0565	1430	-18.03	1420	-10.89

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years A.D.
1699	-14.11	1710	-19.93	1710	-18.16	1710	-18.42	1660	-9.695	1971	-146.533	1941	-22.936	1941	-18.31	1941	-23.09	1941	-54.1298	1967
1689	-15.50	1700	-19.42	1700	-18.74	1700	-16.75	1650	-8.955	1970	-146.533	1940	-21.881	1940	-19.77	1940	-25.06	1940	-54.1298	1966
1679	-15.14	1690	-19.58	1690	-19.04	1690	-17.65	1640	-8.39	1969	-146.102	1939	-21.439	1939	-19.73	1939	-25.83	1939	-54.1375	1965
1669	-13.44	1680	-19.28	1680	-18.97	1680	-16.60	1630	-7.915	1968	-145.793	1938	-22.535	1938	-18.2	1938	-24.5	1938	-54.1413	1964
1659	-12.54	1670	-20.63	1670	-19.12	1670	-16.56	1620	-7.77	1967	-145.385	1937	-22.617	1937	-16.16	1937	-24.49	1937	-54.1413	1963
1649	-13.44	1660	-20.72	1660	-19.19	1660	-18.22	1610	-8.02	1966	-145.548	1936	-22.767	1936	-17.54	1936	-25.18	1936	-54.1413	1962
1639	-14.15	1650	-19.95	1650	-19.27	1650	-17.57	1600	-8	1965	-145.753	1935	-22.385	1935	-17.45	1935	-26.1	1935	-54.1923	1961
1629	-12.91	1640	-20.04	1640	-19.29	1640	-17.68	1590	-9.4	1964	-146.034	1934	-22.966	1934	-18.2	1934	-26.14	1934	-54.2594	1960
1619	-13.44	1630	-20.84	1630	-19.39	1630	-20.36	1580	-9.755	1963	-146.034	1933	-21.115	1933	-19.72	1933	-26.01	1933	-54.2594	1959
1609	-13.70	1620	-21.29	1620	-18.85	1620	-14.50	1570	-9.455	1962	-146.034	1932	-22.25	1932	-20.78	1932	-27.61	1932	-54.2594	1958
1599	-13.80	1610	-20.78	1610	-19.59	1610	-16.21	1560	-9.405	1961	-146.034	1931	-21.202	1931	-19.69	1931	-25.64	1931	-54.279	1957
1589	-14.20	1600	-21.10	1600	-18.74	1600	-17.07	1550	-8.68	1960	-146.673	1930	-22.2	1930	-19.73	1930	-27.43	1930	-54.3005	1956
1579	-14.41	1590	-20.83	1590	-19.76	1590	-16.06	1540	-8.12	1959	-146.81	1929	-22.074	1929	-20.17	1929	-25.71	1929	-54.3005	1955
1569	-14.36	1580	-20.53	1580	-19.37	1580	-17.35	1530	-8.37	1958	-147.183	1928	-21.983	1928	-19	1928	-25.88	1928	-54.3005	1954
1559	-11.71	1570	-20.71	1570	-19.58	1570	-16.75	1520	-8.425	1957	-147.643	1927	-22.103	1927	-18.82	1927	-26.65	1927	-54.3005	1953
1549	-14.56	1560	-20.69	1560	-18.77	1560	-17.54	1510	-8.655	1956	-147.643	1926	-21.85	1926	-19.19	1926	-25.62	1926	-54.2381	1952
1539	-14.68	1550	-19.98	1550	-19.19	1550	-20.27	1500	-8.78	1955	-148.609	1925	-22.115	1925	-20.17	1925	-26.83	1925	-54.0785	1951
1529	-12.87	1540	-20.56	1540	-19.21	1540	-17.09	1490	-9.23	1954	-148.678	1924	-21.796	1924	-19.3	1924	-26.06	1924	-54.0785	1950
1519	-15.19	1530	-20.71	1530	-19.04	1530	-14.94	1480	-9.275	1953	-148.678	1923	-21.849	1923	-19.43	1923	-25.79	1923	-54.0098	1949
1509	-14.84	1520	-21.33	1520	-19.69	1520	-17.67	1470	-9.48	1952	-148.367	1922	-21.904	1922	-20.29	1922	-26.23	1922	-53.9927	1948
1499	-16.23	1510	-20.56	1510	-19.15	1510	-15.16	1460	-9.875	1951	-147.168	1921	-22.635	1921	-19.34	1921	-25.78	1921	-53.9927	1947
1489	-14.67	1500	-19.93	1500	-19.58	1500	-16.82	1450	-10.805	1950	-147.168	1920	-22.229	1920	-19.51	1920	-25.07	1920	-53.9026	1946
1479	-13.07	1490	-20.34	1490	-19.44	1490	-17.99	1440	-11	1949	-146.103	1919	-22.427	1919	-18.3	1919	-24.83	1919	-53.7513	1945
1469	-13.17	1480	-20.58	1480	-19.31	1480	-17.23	1430	-10.715	1948	-145.685	1918	-22.168	1918	-20.89	1918	-25.53	1918	-53.7513	1944
1459	-14.57	1470	-20.77	1470	-19.20	1470	-13.92	1420	-9.72	1947	-144.552	1917	-23.081	1917	-18.78	1917	-25.83	1917	-53.6484	1943
1449	-12.17	1460	-20.24	1460	-19.03	1460	-17.68	1410	-9.585	1946	-143.688	1916	-21.154	1916	-19.35	1916	-24.13	1916	-53.6358	1942
1439	-15.50	1450	-21.29	1450	-19.10	1450	-17.47	1400	-9.065	1945	-142.947	1915	-22.723	1915	-19.77	1915	-25.6	1915	-53.669	1941
1429	-13.14	1440	-20.60	1440	-19.64	1440	-17.94	1390	-9.4	1944	-142.351	1914	-22.261	1914	-18.54	1914	-26.69	1914	-53.6759	1940
1419	-13.42	1430	-21.38	1430	-19.04	1430	-11.68	1380	-11.06	1943	-143.729	1913	-22.12	1913	-17.6	1913	-26.41	1913	-53.6759	1939

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	Year	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
-291.5	1941	-29.5679	1965	-442.7	1.9	1958	0.24397	550	-35.09	1941	0.13
-305.2	1940	-29.5475	1964	-443.4	1.8	1957	0.24589	500	-35.68	1940	1.941
-290.2	1939	-29.5475	1963	-444.2	1.7	1956	0.25364	450	-35.42	1939	0.163
-300.2	1938	-29.5475	1962	-444.7	1.6	1955	0.21372	400	-34.84	1938	0.004
-306.5	1937	-29.4328	1961	-445.3	1.6	1954	0.29944	350	-35.68	1937	-0.798
-290.3	1936	-29.3999	1960	-445.6	1.7	1953	0.28974	300	-35.22	1936	0.251
-297.5	1935	-29.3999	1959	-446.8	1.7	1952	0.26748	250	-35.72	1935	0.844
-276.5	1934	-29.4007	1958	-447.5	1.7	1951	0.26941	200	-35.43	1934	-0.207
-280.8	1933	-29.4007	1957	-447.7	1.6	1950	0.17216	150	-35.19	1933	-0.468
-274.7	1932	-29.524	1956	-448.1	1.7	1949	0.19777	100	-34.66	1932	0.516
-275.9	1931	-29.5276	1955	-447.7	1.8	1948	0.21736	50	-35.03	1931	-0.113
-274.9	1930	-29.5562	1954	-447.7	1.7	1947	0.35062	0	-35	1930	-0.193
-301.2	1929	-29.5973	1953	-448.7	1.5	1946	0.23286			1929	1.207
-295.8	1928	-29.5973	1952	-449.5	1.7	1945	0.19602			1928	-0.519
-284.2	1927	-29.6499	1951	-449.3	1.8	1944	0.31184			1927	-1.765
-284.5	1926	-29.6724	1950	-447.5	1.8	1943	0.24949			1926	1.147
-282.4	1925	-29.6735	1949	-444.7	1.6	1942	0.28306			1925	-0.431
-269.4	1924	-29.6738	1948	-441.1	1.5	1941	0.33673			1924	-0.562
-302	1923	-29.6738	1947	-437.9	1.5	1940	0.22765			1923	1.43
-309.9	1922	-29.6745	1946	-434.9	1.7	1939	0.24173			1922	-0.624
-288.3	1921	-29.6757	1945	-432.4	1.6	1938	0.28235			1921	-2.14
-261.1	1920	-29.6757	1944	-431.3	1.6	1937	0.21755			1920	-0.518
-268.1	1919	-29.6757	1943	-430.5	1.7	1936	0.17194			1919	-2.461
-295.1	1918	-29.6757	1942	-431.0	1.9	1935	0.23899			1918	-1.649
-277.9	1917	-29.6765	1941	-431.4	1.9	1934	0.28011			1917	2.781
-239.3	1916	-29.677	1940	-433.1	2.1	1933	0.30828			1916	0.861
-261.2	1915	-29.677	1939	-434.8	2.0	1932	0.22196			1915	-1.339
-281.5	1914	-29.6774	1938	-437.0	1.8	1931	0.18216			1914	-1.013
-276.5	1913	-29.678	1937	-439.3	1.9	1930	0.34585			1913	-1.112

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1913	-1.481	1671	-0.416	1890.986	59	8	33.5	1914	-0.274	1915	2719	1681	2.21	1924	-1.535	1912	-24.2578
1912	1.2	1666	-0.463	1889.217	53	60	56.5	1913	0.543	1914	2750	1676	3.13	1923	0.041	1911	-25.9542
1911	1.195	1661	-0.023	1887.444	31	77	54	1912	1.805	1913	2815	1671	3.8	1922	-0.725	1910	-23.8092
1910	0.314	1656	-0.224	1885.665	63	53	58	1911	-0.223	1912	2816	1666	4.77	1921	-1.625	1909	-23.8277
1909	-0.607	1651	0.334	1883.881	94	40	67	1910	-0.986	1911	2808	1661	7.95	1920	-0.333	1908	-25.5795
1908	-0.208	1646	-0.251	1882.092	79	48	63.5	1909	0.605	1910	2939	1656	6.13	1919	-0.426	1907	-23.6832
1907	0.838	1641	-0.433	1880.298	45	49	47	1908	1.842	1909	3038	1651	4.19	1918	-0.61	1906	-23.0676
1906	0.65	1636	-0.47	1878.498	28	63	45.5	1907	-0.247	1908	2970	1646	6.51	1917	-0.854	1905	-23.173
1905	0.022	1631	-0.456	1876.693	51	57	54	1906	0.55	1907	2809	1641	7.4	1916	1.952	1904	-23.023
1904	-2.263	1626	-0.57	1874.884	25	28	26.5	1905	-0.086	1906	2765	1636	11.96	1915	-0.176	1903	-23.8203
1903	-3.003	1621	0.25	1873.068	96	70	83	1904	0.588	1905	2835	1631	9.25	1914	-0.895	1902	-24.1572
1902	-4.024	1616	-0.009	1871.248	92	40	66	1903	-0.361	1904	2776	1626	4	1913	-0.567	1901	-22.5807
1901	-4.194	1611	1.161	1869.422	38	100	69	1902	0.36	1903	2595	1621	6.31	1912	0.024	1900	-22.683
1900	-4.753	1606	0.97	1867.591	67.001	100	83.5005	1901	0.589	1902	2664	1616	7.8	1911	0.177	1899	-23.3728
1899	-6.783	1601	0.515	1865.754	47	89	68	1900	0.165	1901	2817	1611	7.85	1910	-0.243	1898	-22.0945
1898	-6.828	1596	1.325	1863.912	73	86	79.5	1899	-0.072	1900	2902	1606	7.89	1909	0.666	1897	-23.8041
1897	-5.59	1591	0.017	1862.065	92	46	69	1898	-0.629	1899	2750	1601	4.65	1908	1.208	1896	-24.6885
1896	-3.492	1586	0.334	1860.212	45	67	56	1897	-0.287	1898	2622	1596	5.34	1907	-0.989	1895	-24.541
1895	-2.224	1581	-0.108	1858.354	66	81	73.5	1896	0.209	1897	2662	1591	7.59	1906	-1.39	1894	-23.4731
1894	0.031	1576	-0.472	1856.491	40	70	55	1895	0.863	1896	2814	1586	3.23	1905	-1.147	1893	-22.5337
1893	-0.426	1571	-0.174	1854.622	17	70	43.5	1894	1.505	1895	2806	1581	3.29	1904	-0.65	1892	-23.4349
1892	-0.926	1566	0.158	1852.747	27	60	43.5	1893	1.138	1894	2612	1576	3.74	1903	-0.695	1891	-23.7465
1891	-1.948	1561	-0.492	1850.867	5.001	79	42.0005	1892	0.737	1893	2752	1571	4	1902	0.955	1890	-24.2277
1890	-2.595	1556	-0.009	1848.981	15.999	49	32.4995	1891	0.003	1892	2872	1566	7.05	1901	0.485	1889	-24.7986
1889	-3.109	1551	-0.106	1847.09	43	50	46.5	1890	-0.25	1891	2898	1561	8.72	1900	-0.894	1888	-25.1007
1888	-3.109	1546	-0.149	1845.193	15	9	12	1889	0.478	1890	2790	1556	10.66	1899	-0.672	1887	-26.062
1887	-2.772	1541	-0.213	1843.291	26	4	15	1888	-0.748	1889	2789	1551	12.02	1898	0.203	1886	-22.7178
1886	-2.228	1536	0.162	1841.382	67	14	40.5	1887	-0.512	1888	2837	1546	13.97	1897	-0.46	1885	-24.9179
1885	-1.3	1531	0.067	1839.469	56	19	37.5	1886	-0.787	1887	2787	1541	14.25	1896	0.166	1884	-25.2024

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pc1yr2			pc25yrsp		sgreenpc		del1dye2		Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
1934	1.6399		1934	52.2733	1912	9.53	1916	-24.14	1942	0.32	-33.1	1926	-15.795	1.4505	1420	-17.64	1410	-12.03
1933	15.0527		1933	48.4705	1911	9.55	1915	-27.02	1941	0.35	-32.6	1925	-16.455	1.5275	1410	-17.75	1400	-12.80
1932	83.6386		1932	48.583	1910	9.56	1914	-27.6	1940	0.26	-35.9	1924	-16.715	1.3685	1400	-18.38	1390	-11.03
1931	106.01		1931	31.6071	1909	9.78	1913	-26.71	1939	0.3	-35.2	1923	-17.325	1.7755	1390	-17.99	1380	-11.31
1930	105.9103		1930	33.4006	1908	10.02	1912	-26.87	1938	0.36	-33.5	1922	-18.79	1.556	1380	-17.05	1370	-11.36
1929	69.2832		1929	38.9718	1907	10.22	1911	-26.41	1937	0.34	-34.5	1921	-20.135	1.5625	1370	-16.90	1360	-12.83
1928	59.7938		1928	62.848	1906	10.34	1910	-26.35	1936	0.27	-38.2	1920	-19.36	1.9295	1360	-17.41	1350	-11.09
1927	101.1255		1927	45.3062	1905	10.39	1909	-25.51	1935	0.47	-34.9	1919	-17.645	1.4295	1350	-18.74	1340	-11.27
1926	93.0418		1926	60.2025	1904	10.42	1908	-27.33	1934	0.34	-34.2	1918	-19.645	1.544	1340	-16.87	1330	-11.30
1925	83.5824		1925	50.1703	1903	10.41	1907	-26.06	1933	0.23	-33.6	1917	-19.16	1.568	1330	-17.37	1320	-10.10
1924	58.4635		1924	31.8034	1902	10.34	1906	-26.14	1932	0.46	-29.1	1916	-17.785	1.594	1320	-16.95	1310	-11.37
1923	104.234		1923	25.8626	1901	10.35	1905	-25.33	1931	0.26	-33.5	1915	-17.275	1.3645	1310	-17.59	1300	-11.23
1922	101.2409		1922	28.3401	1900	10.69	1904	-26.46	1930	0.21	-35.5	1914	-15.58	1.4745	1300	-18.49	1290	-11.52
1921	103.8114		1921	21.2723	1899	10.67	1903	-24.49	1929	0.31	-33.4	1913	-17.395	1.1975	1290	-18.60	1280	-10.93
1920	60.6448		1920	28.7673	1898	9.71	1902	-25.51	1928	0.21	-33.5	1912	-16.885	1.5755	1280	-16.74	1270	-11.04
1919	61.2911		1919	54.1838	1897	9.23	1901	-25.87	1927	0.47	-33.4	1911	-18	1.6915	1270	-18.72	1260	-10.76
1918	55.5149		1918	30.0896	1896	9.27	1900	-26.99	1926	0.35	-32.6	1910	-19.555	1.3985	1260	-17.62	1250	-10.20
1917	47.5155		1917	48.752	1895	9.57	1899	-27.78	1925	0.27	-35.8	1909	-19.285	1.1205	1250	-16.86	1240	-10.69
1916	45.3434		1916	38.8849	1894	9.95	1898	-25.08	1924	0.34	-37.6	1908	-19.76	1.8045	1240	-18.79	1230	-9.56
1915	21.2334		1915	40.7633	1893	10.25	1897	-26.05	1923	0.39	-34.5	1907	-18.32	1.3855	1230	-17.70	1220	-9.84
1914	14.5528		1914	64.1918	1892	10.66	1896	-27.04	1922	0.45	-33.6	1906	-15.34	1.07	1220	-17.01	1210	-10.58
1913	0.001		1913	46.4937	1891	10.84	1895	-23.67	1921	0.63	-30.6	1905	-14.75	1.2655	1210	-18.37	1200	-9.88
1912	37.3561		1912	54.1286	1890	10.64	1894	-24.86	1920	0.75	-33.4	1904	-18.37	1.6865	1200	-17.98	1190	-10.28
1911	0.001		1911	36.4066	1889	10.58	1893	-23.66	1919	0.33	-35.4	1903	-18.795	1.427	1190	-18.11	1180	-10.86
1910	21.084		1910	63.1664	1888	10.71	1892	-24.97	1918	0.43	-35.6	1902	-17.555	1.601	1180	-18.14	1170	-11.79
1909	6.2899		1909	30.3366	1887	10.81	1891	-25.35	1917	0.54	-36.3	1901	-15.39	0.947	1170	-18.16	1160	-11.76
1908	10.7902		1908	53.6843	1886	10.67	1890	-25.89	1916	0.76	-33.3	1900	-16.155	1.242	1160	-17.27	1150	-10.64
1907	49.5599		1907	40.7034	1885	10.11	1889	-26.51	1915	0.42	-34.9	1899	-18.16	1.5035	1150	-17.99	1140	-11.60
1906	56.1182		1906	44.6362	1884	10	1888	-26.23	1914	0.38	-34.5	1898	-18.465	1.175	1140	-18.17	1130	-11.39

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years A.D.
1409	-12.96	1420	-20.79	1420	-19.25	1420	-16.55	1370	-12.37	1942	-144.784	1912	-22.01	1912	-23.04	1912	-25.61	1912	-53.7885	1938
1399	-12.26	1410	-21.09	1410	-19.06	1410	-16.69	1360	-12.825	1941	-144.784	1911	-21.929	1911	-20.13	1911	-26.47	1911	-53.8128	1937
1389	-12.52	1400	-20.46	1400	-18.80	1400	-15.33	1350	-12.14	1940	-144.948	1910	-21.346	1910	-18.9	1910	-24.45	1910	-53.852	1936
1379	-14.24	1390	-19.81	1390	-18.65	1390	-16.99	1340	-11.79	1939	-145.387	1909	-20.624	1909	-19.57	1909	-26.3	1909	-53.9789	1935
1369	-13.92	1380	-20.60	1380	-18.56	1380	-13.79	1330	-11.935	1938	-145.381	1908	-20.099	1908	-20.49	1908	-25.71	1908	-53.9789	1934
1359	-14.58	1370	-20.71	1370	-18.93	1370	-15.43	1320	-11.645	1937	-145.277	1907	-21.72	1907	-20.36	1907	-27.05	1907	-54.0565	1933
1349	-14.17	1360	-20.27	1360	-19.23	1360	-13.79	1310	-11.52	1936	-145.277	1906	-21.634	1906	-18.08	1906	-26.93	1906	-54.1842	1932
1339	-14.83	1350	-20.36	1350	-18.96	1350	-16.14	1300	-11.885	1935	-144.425	1905	-22.312	1905	-19.28	1905	-25.47	1905	-54.1842	1931
1329	-13.34	1340	-20.69	1340	-18.80	1340	-18.39	1290	-11.385	1934	-144.368	1904	-21.895	1904	-19.72	1904	-25.67	1904	-54.1842	1930
1319	-15.78	1330	-21.03	1330	-18.20	1330	-17.73	1280	-10.635	1933	-144.191	1903	-21.369	1903	-19.33	1903	-27.07	1903	-54.4045	1929
1309	-13.93	1320	-20.41	1320	-18.54	1320	-14.68	1270	-9.585	1932	-143.371	1902	-21.016	1902	-18.7	1902	-24.93	1902	-54.639	1928
1299	-14.69	1310	-21.12	1310	-18.35	1310	-17.31	1260	-8.875	1931	-143.299	1901	-20.276	1901	-18.5	1901	-25.27	1901	-54.8356	1927
1289	-16.21	1300	-20.35	1300	-18.46	1300	-16.55	1250	-8.645	1930	-142.604	1900	-20.78	1900	-18.9	1900	-25.98	1900	-54.9612	1926
1279	-17.57	1290	-20.42	1290	-18.84	1290	-14.16	1240	-8.775	1929	-142.604	1899	-20.404	1899	-19.26	1899	-26.14	1899	-55.2053	1925
1269	-16.91	1280	-21.00	1280	-18.62	1280	-15.95	1230	-9.455	1928	-142.777	1898	-22.549	1898	-18.4	1898	-26.87	1898	-55.2053	1924
1259	-17.58	1270	-20.24	1270	-18.49	1270	-17.11	1220	-9.665	1927	-142.894	1897	-23.113	1897	-17.87	1897	-26.64	1897	-55.3561	1923
1249	-14.23	1260	-20.44	1260	-18.12	1260	-16.79	1210	-9.885	1926	-142.9	1896	-22.29	1896	-19.27	1896	-26.34	1896	-55.4004	1922
1239	-13.81	1250	-21.12	1250	-18.41	1250	-16.72	1200	-10.25	1925	-143.271	1895	-21.908	1895	-19.7	1895	-25.59	1895	-55.3359	1921
1229	-13.53	1240	-19.67	1240	-18.71	1240	-15.12	1190	-9.945	1924	-143.271	1894	-20.478	1894	-18.4	1894	-24.26	1894	-55.0624	1920
1219	-13.18	1230	-20.89	1230	-18.27	1230	-15.90	1180	-9.805	1923	-143.257	1893	-21.288	1893	-17.2	1893	-25.6	1893	-55.0624	1919
1209	-15.38	1220	-21.30	1220	-18.54	1220	-15.48	1170	-9.855	1922	-142.76	1892	-21.938	1892	-20.09	1892	-25.84	1892	-55.0624	1918
1199	-15.49	1210	-20.69	1210	-18.44	1210	-18.02	1160	-9.915	1921	-142.76	1891	-22.379	1891	-18.41	1891	-25.78	1891	-54.9404	1917
1189	-12.89	1200	-21.34	1200	-18.31	1200	-16.12	1150	-10.1	1920	-142.458	1890	-22.776	1890	-17.94	1890	-24.27	1890	-54.8219	1916
1179	-13.46	1190	-20.78	1190	-17.68	1190	-15.03	1140	-10.215	1919	-142.393	1889	-22.068	1889	-16.51	1889	-25.12	1889	-54.7448	1915
1169	-12.77	1180	-21.08	1180	-17.81	1180	-15.91	1130	-10.22	1918	-142.488	1888	-22.209	1888	-19.71	1888	-25.39	1888	-54.7448	1914
1159	-13.84	1170	-20.98	1170	-18.21	1170	-16.42	1120	-10.26	1917	-142.83	1887	-21.232	1887	-19.12	1887	-25.07	1887	-54.7448	1913
1149	-13.95	1160	-20.77	1160	-17.54	1160	-14.25	1110	-9.74	1916	-142.83	1886	-21.003	1886	-20.86	1886	-25.05	1886	-54.7864	1912
1139	-13.67	1150	-20.50	1150	-18.26	1150	-15.25	1100	-7.9	1915	-142.83	1885	-21.889	1885	-19.95	1885	-25.44	1885	-55.1334	1911
1129	-12.12	1140	-20.67	1140	-18.24	1140	-15.66	1090	-7.22	1914	-142.83	1884	-22.148	1884	-19.32	1884	-26.12	1884	-55.5412	1910

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
-284.3	1912	-29.678	1936	-440.9	1.9	1929	0.26544			1912	0.771
-269.9	1911	-29.6263	1935	-441.9	1.8	1928	0.25963			1911	-0.703
-282	1910	-29.6106	1934	-441.7	1.9	1927	0.25372			1910	-0.357
-285.3	1909	-29.6106	1933	-440.7	1.9	1926	0.17187			1909	0.312
-281.2	1908	-29.547	1932	-440.8	2.0	1925	0.28292			1908	-0.506
-277.3	1907	-29.5261	1931	-440.4	1.9	1924	0.15218			1907	-2.037
-282.4	1906	-29.5261	1930	-440.1	1.8	1923	0.24976			1906	-2.205
-291.7	1905	-29.5936	1929	-439.3	1.6	1922	0.17382			1905	-1.985
-297.2	1904	-29.6169	1928	-439.2	1.7	1921	0.24415			1904	0.934
-283	1903	-29.6133	1927	-439.3	1.9	1920	0.30816			1903	-1.325
-258.1	1902	-29.6246	1926	-439.8	1.9	1919	0.1473			1902	-0.229
-259.6	1901	-29.7686	1925	-440.4	1.9	1918	0.16873			1901	0.776
-267.3	1900	-29.7686	1924	-440.2	2.0	1917	0.27511			1900	-1.719
-243.4	1899	-29.8226	1923	-440.9	2.1	1916	0.29727			1899	-0.531
-259.5	1898	-29.8269	1922	-441.7	1.9	1915	0.23429			1898	-1.86
-271.1	1897	-29.8271	1921	-441.4	1.8	1914	0.34201			1897	0.253
-259.5	1896	-29.8279	1920	-439.9	1.9	1913	0.21429			1896	-0.109
-294.7	1895	-29.8279	1919	-437.5	1.9	1912	0.27944			1895	1.275
-276.2	1894	-29.7748	1918	-434.6	1.9	1911	0.23708			1894	-1.489
-250.1	1893	-29.7256	1917	-433.1	1.9	1910	0.25934			1893	1.969
-261.7	1892	-29.5777	1916	-431.6	1.7	1909	0.26732			1892	0.014
-282.7	1891	-29.5753	1915	-430.2	1.7	1908	0.26804			1891	-0.993
-265.1	1890	-29.4639	1914	-429.7	1.9	1907	0.20331			1890	-1.466
-275.4	1889	-29.3922	1913	-431.3	1.7	1906	0.3132			1889	-0.642
-279.6	1888	-29.3505	1912	-432.7	1.5	1905	0.11662			1888	2.813
-303.3	1887	-29.3128	1911	-434.5	1.6	1904	0.16799			1887	0.342
-304.8	1886	-29.2199	1910	-436.6	1.6	1903	0.27829			1886	-1.594
-304.7	1885	-29.2199	1909	-439.5	1.6	1902	0.16872			1885	-1.838
-301.6	1884	-29.3725	1908	-442.8	1.5	1901	0.13226			1884	-0.826

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1884	-0.349	1526	-0.19	1837.549	47	32	39.5	1885	-0.83	1886	2860	1536	22.66	1895	0.864	1883	-24.5762
1883	0.4	1521	0.065	1835.624	80	38	59	1884	0.38	1885	2941	1531	22.97	1894	0.681	1882	-25.5098
1882	1.336	1516	-0.369	1833.693	54	73	63.5	1883	-0.464	1884	2853	1526	8.3	1893	0.029	1881	-24.0004
1881	0.616	1511	-0.051	1831.756	88	74	81	1882	0.223	1883	2765	1521	6.67	1892	-0.155	1880	-22.6156
1880	0.308	1506	-0.432	1829.814	86	56	71	1881	0.761	1882	2725	1516	3.3	1891	-0.191	1879	-23.9442
1879	-0.537	1501	0.412	1827.865	92	75	83.5	1880	0.378	1881	2845	1511	3.22	1890	-0.745	1878	-21.9606
1878	0.352	1496	0.051	1825.911	100	79	89.5	1879	0.668	1880	2860	1506	3.84	1889	0.604	1877	-21.6885
1877	0.445	1491	-0.432	1823.951	98	100	99	1878	0.625	1879	2868	1501	7.97	1888	0.829	1876	-24.2868
1876	-0.376	1486	-0.467	1821.985	96	100	98	1877	0.66	1878	2954	1496	10.02	1887	0.011	1875	-24.7865
1875	-1.305	1481	0.182	1820.013	100	100	100	1876	0.786	1877	2952	1491	10.43	1886	-0.686	1874	-24.3751
1874	-1.566	1476	-0.427	1818.035	88	100	94	1875	0.355	1876	2821	1486	11.74	1885	-0.983	1873	-24.1259
1873	-1.092	1471	0.739	1816.051	85	97	91	1874	-0.394	1875	2733	1481	10.83	1884	-0.435	1872	-24.5615
1872	-0.803	1466	0.65	1814.062	100	100	100	1873	-1.398	1874	2743	1476	4.27	1883	-0.339	1871	-22.9355
1871	0.249	1461	0.513	1812.066	100	95	97.5	1872	1.469	1873	2786	1471	3.87	1882	-0.912	1870	-23.456
1870	0.327	1456	0.369	1810.064	100	75	87.5	1871	2.194	1872	2696	1466	6.7	1881	-0.144	1869	-24.6617
1869	-1.118	1451	0.262	1808.056	77	96	86.5	1870	0.352	1871	2599	1461	6.32	1880	0.454	1868	-24.7904
1868	-3.786	1446	-0.394	1806.042	50	99	74.5	1869	-0.807	1870	2647	1456	4.23	1879	0.047	1867	-24.1574
1867	-3.985	1441	-0.287	1804.022	88	61	74.5	1868	-0.649	1869	2798	1451	2.76	1878	0.638	1866	-24.749
1866	-1.807	1436	-0.396	1801.996	90	37	63.5	1867	0.345	1868	2978	1446	9.73	1877	0.236	1865	-25.198
1865	0.46	1431	-0.045	1799.963	100	51	75.5	1866	-0.697	1867	2906	1441	10.55	1876	1.038	1864	-25.5202
1864	2.544	1426	0.179	1797.925	95	77	86	1865	-0.602	1866	2757	1436	7.69	1875	0.808	1863	-25.6727
1863	2.077	1421	-0.402	1795.88	43	97	70	1864	-0.222	1865	2685	1431	6.52	1874	-0.554	1862	-24.6628
1862	1.209	1416	-0.325	1793.829	71	81	76	1863	-0.481	1864	2704	1426	6.41	1873	-0.565	1861	-25.0278
1861	0.98	1411	0.392	1791.771	66	67	66.5	1862	-1.534	1863	2704	1421	7.39	1872	1.086	1860	-24.095
1860	1.001	1406	0.336	1789.708	65	78	71.5	1861	-0.566	1862	2727	1416	7.56	1871	1.43	1859	-22.8943
1859	2.618	1401	-0.369	1787.638	44	64	54	1860	-1.212	1861	2850	1411	6.48	1870	0.369	1858	-23.5742
1858	4.712	1396	0.169	1785.561	78	64	71	1859	-0.474	1860	2863	1406	6.55	1869	-0.414	1857	-23.8866
1857	6.987	1391	0.551	1783.479	61	55	58	1858	-0.073	1859	2793	1401	7.13	1868	-0.53	1856	-25.5411
1856	6.572	1386	0.367	1781.389	74	14	44	1857	0.316	1858	2803	1396	6.06	1867	0.074	1855	-25.0254
1855	5.99	1381	-0.149	1779.294	42	24	33	1856	0.003	1857	2862	1391	4.09	1866	-1.017	1854	-24.3259
1854	5.622	1376	0.019	1777.192	48	59	53.5	1855	-0.931	1856	2897	1386	5.59	1865	-0.826	1853	-23.2087
1853	4.266	1371	0.024	1775.083	37.5	63	50.25	1854	-0.603	1855	2964	1381	8.85	1864	-0.362	1852	-25.1156

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island			Fisher et al., 1998 - Penny Ice Cap, Baffin Island		Fisher, D.A., 2002 - S. Greenland		Fisher, D.A., 2004 - S. Greenland		Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2			pc25yrsp		sgreenpc		del1dye2		Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
1905	67.2719		1905	51.8882	1883	9.84	1887	-25.59	1913	0.46	-33.4	1897	-17.18	1.353	1130	-16.97	1120	-11.12
1904	42.1875		1904	46.6216	1882	9.54	1886	-25.36	1912	0.53	-32.8	1896	-16.445	1.3175	1120	-17.57	1110	-9.98
1903	38.8261		1903	36.021	1881	9.17	1885	-26.27	1911	0.43	-33.8	1895	-18.765	1.9685	1110	-17.95	1100	-9.64
1902	42.7988		1902	46.2857	1880	9.02	1884	-25.19	1910	0.31	-32.1	1894	-19.89	1.302	1100	-17.60	1090	-11.19
1901	50.9595		1901	72.0422	1879	9.28	1883	-26.61	1909	0.29	-34.8	1893	-20.015	1.4055	1090	-17.49	1080	-10.49
1900	77.158		1900	66.5334	1878	9.8	1882	-25.79	1908	0.34	-32.6	1892	-18.065	1.565	1080	-15.87	1070	-11.23
1899	66.4748		1899	31.1765	1877	10.34	1881	-26.28	1907	0.39	-31.3	1891	-18.535	1.312	1070	-17.08	1060	-10.80
1898	100.7898		1898	60.7797	1876	10.43	1880	-26.01	1906	0.48	-32.3	1890	-18.68	1.4055	1060	-18.68	1050	-10.98
1897	92.7822		1897	40.8834	1875	10.38	1879	-26.29	1905	0.35	-36.1	1889	-18.625	1.174	1050	-18.23	1040	-11.64
1896	84.7399		1896	39.7272	1874	10.24	1878	-25.29	1904	0.54	-31.6	1888	-16.81	1.525	1040	-18.98	1030	-10.80
1895	11.7829		1895	36.9987	1873	10	1877	-25.34	1903	0.6	-31.9	1887	-17.065	1.423	1030	-18.04	1020	-10.74
1894	59.0846		1894	35.1745	1872	10.27	1876	-26.94	1902	0.38	-33.1	1886	-18.815	1.2605	1020	-17.37	1010	-11.37
1893	91.1628		1893	23.9949	1871	10.39	1875	-26.4	1901	0.52	-33.8	1885	-18.73	1.8055	1010	-18.45		
1892	85.7892		1892	26.2116	1870	10.24	1874	-27.77	1900	0.64	-32.7	1884	-18.975	1.4515				
1891	85.7193		1891	29.1804	1869	10.05	1873	-26.17	1899	0.4	-32.8	1883	-17.865	1.374				
1890	52.2693		1890	30.3054	1868	9.81	1872	-27.37	1898	0.28	-33.5	1882	-18.15	1.1785				
1889	45.4752		1889	34.4538	1867	9.63	1871	-27.42	1897	0.49	-32.9	1881	-16.465	1.55				
1888	66.7956		1888	30.5583	1866	9.33	1870	-25.74	1896	0.41	-33.1	1880	-17.685	1.215				
1887	33.5751		1887	16.1121	1865	9.21	1869	-28.61	1895	0.2	-31.5	1879	-18.4	1.741				
1886	33.2656		1886	46.1362	1864	9.12	1868	-28.37	1894	0.2	-27.7	1878	-15.28	2.035				
1885	31.8892		1885	35.6686	1863	9.16	1867	-27.12	1893	0.53	-32.2	1877	-18.48	1.4625				
1884	5.9658		1884	30.3151	1862	9.2	1866	-25.68	1892	0.53	-35.3	1876	-18.43	1.4485				
1883	100.0977		1883	31.6726	1861	9.24	1865	-27.82	1891	0.42	-32.1	1875	-20.1	1.719				
1882	60.1682		1882	57.4399	1860	9.32	1864	-28.83	1890	0.63	-32.5	1874	-20.195	1.3915				
1881	72.513		1881	57.6606	1859	9.41	1863	-27.79	1889	0.41	-31.7	1873	-19.205	1.353				
1880	55.4389		1880	42.4303	1858	9.49	1862	-28.51	1888	0.16	-37.5	1872	-19.325	1.337				
1879	78.3733		1879	41.7467	1857	9.39	1861	-26.73	1887	0.25	-32.6	1871	-19.755	1.205				
1878	39.5184		1878	39.8111	1856	9.58	1860	-26.51	1886	0.18	-31.2	1870	-19.04	1.5045				
1877	84.7747		1877	39.0933	1855	9.87	1859	-25.4	1885	0.15	-30.9	1869	-18.085	1.547				
1876	23.2773		1876	31.4186	1854	9.78	1858	-26.89	1884	0.16	-32.3	1868	-19.655	1.3095				
1875	36.4804		1875	29.1745	1853	9.63	1857	-26.47	1883	0.38	-33.2	1867	-19.225	1.595				
1874	40.3591		1874	45.2076	1852	9.42	1856	-24.69	1882	0.33	-33.5	1866	-15.465	1.331				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years A.D.
1119	-14.95	1130	-21.94	1130	-18.29	1130	-14.10	1080	-7.84	1913	-143.166	1883	-21.521	1883	-19.29	1883	-26.88	1883	-55.7746	1909
1109	-14.46	1120	-21.38	1120	-18.57	1120	-16.75	1070	-8.125	1912	-143.29	1882	-22.03	1882	-18.63	1882	-26.27	1882	-56.0097	1908
1099	-12.52	1110	-20.89	1110	-18.43	1110	-16.64	1060	-8.97	1911	-143.423	1881	-21.025	1881	-18.85	1881	-27.03	1881	-56.4164	1907
1089	-14.14	1100	-21.48	1100	-18.50	1100	-17.03	1050	-9.455	1910	-143.525	1880	-20.964	1880	-17.11	1880	-26.21	1880	-56.4164	1906
1079	-14.49	1090	-21.22	1090	-18.75	1090	-17.04	1040	-9.53	1909	-143.525	1879	-21.228	1879	-18.5	1879	-24.96	1879	-56.4164	1905
1069	-14.35	1080	-21.73	1080	-18.03	1080	-19.48	1030	-9.57	1908	-143.483	1878	-21.219	1878	-19.64	1878	-25.01	1878	-56.7352	1904
1059	-14.04	1070	-20.56	1070	-18.05	1070	-14.69	1020	-9.6	1907	-141.845	1877	-21.343	1877	-18.18	1877	-24.29	1877	-56.8538	1903
1049	-14.58	1060	-20.71	1060	-18.45	1060	-17.69	1010	-9.465	1906	-141.845	1876	-20.935	1876	-19.25	1876	-24.82	1876	-56.6413	1902
1039	-14.43	1050	-21.93	1050	-18.37	1050	-17.76	1000	-9.35	1905	-141.845	1875	-21.541	1875	-19.45	1875	-24.79	1875	-56.4863	1901
1029	-13.83	1040	-21.71	1040	-18.41	1040	-19.36	990	-9.195	1904	-141.299	1874	-22.228	1874	-19.39	1874	-25.27	1874	-56.2827	1900
1019	-14.65	1030	-21.52	1030	-18.89	1030	-15.02	980	-9.56	1903	-140.45	1873	-22.468	1873	-19.36	1873	-26.42	1873	-55.5661	1899
1009	-14.75	1020	-21.47	1020	-18.71	1020	-14.38	970	-9.325	1902	-139.997	1872	-21.7	1872	-21.43	1872	-26.36	1872	-55.5661	1898
		1010	-22.18	1010	-18.09	1010	-15.47	960	-9.205	1901	-139.852	1871	-22.514	1871	-18.04	1871	-26.35	1871	-55.4486	1897
								950	-9.285	1900	-140.235	1870	-22.555	1870	-19.34	1870	-25.81	1870	-54.5892	1896
								940	-9.41	1899	-140.6	1869	-21.977	1869	-18.95	1869	-26.5	1869	-54.4714	1895
								930	-10.89	1898	-140.6	1868	-21.32	1868	-20.11	1868	-25.61	1868	-54.4714	1894
								920	-10.815	1897	-140.902	1867	-21.814	1867	-21.35	1867	-25.25	1867	-53.91	1893
								910	-10.885	1896	-140.919	1866	-23.272	1866	-17.9	1866	-26.23	1866	-53.8419	1892
								900	-11.205	1895	-140.938	1865	-22.04	1865	-18.48	1865	-25.03	1865	-54.064	1891
								890	-11.29	1894	-141.124	1864	-22.03	1864	-18.34	1864	-25.86	1864	-54.1246	1890
								880	-11.795	1893	-141.124	1863	-21.99	1863	-18.09	1863	-26.95	1863	-54.1246	1889
								870	-11.285	1892	-141.124	1862	-21.99	1862	-16.14	1862	-25.43	1862	-54.2803	1888
								860	-11.005	1891	-141.514	1861	-21.99	1861	-15.16	1861	-26.33	1861	-54.5231	1887
								850	-10.695	1890	-141.528	1860	-22.462	1860	-17.08	1860	-27.44	1860	-54.6873	1886
								840	-10.415	1889	-141.696	1859	-22.169	1859	-19.25	1859	-26.88	1859	-54.8448	1885
								830	-10.46	1888	-141.962	1858	-21.97	1858	-19.56	1858	-27.28	1858	-54.8448	1884
								820	-10.02	1887	-141.962	1857	-21.95	1857	-17.97	1857	-25.59	1857	-54.8448	1883
								810	-9.985	1886	-142.274	1856	-21.74	1856	-18.99	1856	-23.96	1856	-55.0831	1882
								800	-10.885	1885	-142.424	1855	-21.94	1855	-18.75	1855	-24.8	1855	-55.2045	1881
								790	-10.705	1884	-142.424	1854	-21.91	1854	-17.18	1854	-26.15	1854	-55.4672	1880
								780	-10.6	1883	-142.6	1853	-21.9	1853	-17.67	1853	-26.65	1853	-55.5034	1879
								770	-10.505	1882	-142.742	1852	-21.87	1852	-18.97	1852	-26.72	1852	-55.6427	1878

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delta D mean annual	siple210.ant	O-18
-298.6	1883	-29.4095
-301.4	1882	-29.5104
-312.7	1881	-29.5998
-279.2	1880	-29.5998
-253.6	1879	-29.5998
-252	1878	-29.7087
-256.3	1877	-29.7437
-263.7	1876	-29.7672
-252.6	1875	-29.8139
-286.7	1874	-29.8139
-289.6	1873	-29.8139
-280.3	1872	-29.8917
-291.9	1871	-29.93
-303.5	1870	-29.93
-298.7	1869	-29.93
-294.9	1868	-29.9131
-280.9	1867	-29.8793
-265.8	1866	-29.8972
-268.8	1865	-29.9438
-300.7	1864	-29.9438
-297	1863	-29.9438
-294.5	1862	-29.8628
-293.1	1861	-29.7732
-289.8	1860	-29.7732
-285.2	1859	-29.6114
-287.7	1858	-29.6084
-277.6	1857	-29.5642
-260.8	1856	-29.4836
-263.4	1855	-29.4836
-272	1854	-29.5853
-270.9	1853	-29.622
-282.5	1852	-29.6268

Fisher, D.A.., 2002 - Siple Dome, Antarctica

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1
1907	-446.5	1.5
1906	-448.5	1.5
1905	-450.3	1.7
1904	-451.8	1.7
1903	-452.8	1.6
1902	-452.8	1.5
1901	-452.5	1.7
1900	-451.9	1.7
1899	-450.6	1.5
1898	-449.2	1.7
1897	-447.6	1.7
1896	-445.8	1.7
1895	-444.4	1.7
1894	-443.6	1.6
1893	-443.2	1.6
1892	-442.8	1.5
1891	-442.6	1.7
1890	-441.6	1.6
1889	-440.7	1.6
1888	-439.5	1.6
1887	-437.9	1.6
1886	-437.5	1.8
1885	-437.6	1.9
1884	-437.4	2.0
1883	-437.7	2.2
1882	-437.4	2.1
1881	-436.6	2.2
1880	-435.7	2.0
1879	-435.6	2.3
1878	-436.2	2.3
1877	-437.2	2.5
1876	-438.3	2.5

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1900	0.23562
1899	0.33236
1898	0.20714
1897	0.22247
1896	0.20062
1895	0.35028
1894	0.15671
1893	0.23936
1892	0.29239
1891	0.27054
1890	0.24102
1889	0.23388
1888	0.32534
1887	0.27304
1886	0.266
1885	0.22084
1884	0.32059
1883	0.23711
1882	0.1992
1881	0.18408
1880	0.23059
1879	0.29275
1878	0.31658
1877	0.31741
1876	0.17829
1875	0.21735
1874	0.25672
1873	0.27278
1872	0.29682
1871	0.23477
1870	0.24306
1869	0.267

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1883	-0.35
1882	-1.36
1881	1.045
1880	0.523
1879	1.387
1878	-0.137
1877	-0.491
1876	1.67
1875	1.221
1874	-1.168
1873	0.451
1872	0.103
1871	0.364
1870	-0.666
1869	-0.588
1868	-0.312
1867	0.18
1866	-1.161
1865	-1.045
1864	-1.577
1863	-2.45
1862	0.22
1861	0.398
1860	0.225
1859	-0.524
1858	-1.01
1857	-1.815
1856	1.468
1855	-0.29
1854	0.353
1853	0.967
1852	2.035

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1852	3.151	1366	0.226	1772.968	37	49	43	1853	1.09	1854	2895	1376	10.68	1863	-1.309	1851	-25.0647
1851	1.966	1361	0.468	1770.846	40	42	41	1852	1.508	1853	2805	1371	7.42	1862	-0.621	1850	-24.3686
1850	-0.532	1356	-0.298	1768.718	55	54	54.5	1851	0.169	1852	2797	1366	6.02	1861	-0.573	1849	-23.038
1849	-0.909	1351	-0.3	1766.584	50	50	50	1850	0.231	1851	2804	1361	4.94	1860	-0.588	1848	-24.2624
1848	-0.905	1346	-0.413	1764.442	86	45	65.5	1849	0.271	1850	2797	1356	3.51	1859	-0.135	1847	-23.485
1847	-1.029	1341	-0.514	1762.294	97	64	80.5	1848	-0.529	1849	2827	1351	2.48	1858	-0.165	1846	-24.4718
1846	-1.099	1336	-0.403	1760.139	82	31	56.5	1847	-0.431	1848	2829	1346	3.27	1857	-0.369	1845	-23.951
1845	-1.083	1331	-0.224	1757.978	89	78	83.5	1846	0.109	1847	2835	1341	5.16	1856	-0.019	1844	-23.1932
1844	-0.883	1326	-0.216	1755.809	48	41	44.5	1845	-0.073	1846	2824	1336	5.54	1855	-0.041	1843	-24.4675
1843	-0.94	1321	0.058	1753.634	63.999	18	40.9995	1844	-0.299	1845	2805	1331	5.73	1854	-0.116	1842	-24.6468
1842	-0.645	1316	-0.019	1751.452	37	29	33	1843	-0.637	1844	2762	1326	6.26	1853	0.557	1841	-25.3722
1841	-0.362	1311	0.337	1749.264	25	56	40.5	1842	-0.872	1843	2757	1321	6.47	1852	1.227	1840	-25.2501
1840	0.298	1306	0.302	1747.068	73	52	62.5	1841	-0.928	1842	2768	1316	5.91	1851	0.711	1839	-26.0968
1839	1.314	1301	-0.428	1744.866	76	45	60.5	1840	0.282	1841	2808	1311	4.02	1850	0.017	1838	-24.2108
1838	1.533	1296	0.211	1742.656	76	50	63	1839	-0.401	1840	2791	1306	3.11	1849	-0.681	1837	-25.2037
1837	1.294	1291	-0.375	1740.44	35.999	85	60.4995	1838	-1.353	1839	2696	1301	2.75	1848	-0.314	1836	-24.6319
1836	0.67	1286	-0.049	1738.217	73	100	86.5	1837	-1.478	1838	2697	1296	3.06	1847	0.648	1835	-25.3707
1835	0.592	1281	-0.108	1735.986	18	81	49.5	1836	-3.048	1837	2775	1291	4.13	1846	-0.138	1834	-23.2696
1834	0.533	1276	-0.38	1733.749	76.001	100	88.0005	1835	-1.975	1836	2818	1286	5.98	1845	-0.019	1833	-22.5596
1833	0.587	1271	0.457	1731.504	34	68	51	1834	-1.7	1835	2751	1281	7.76	1844	-0.493	1832	-23.5188
1832	0.419	1266	1.489	1729.253	37	36	36.5	1833	-1.087	1834	2792	1276	8.7	1843	-0.413	1831	-24.2883
1831	-0.186	1261	0.297	1726.994	29	38	33.5	1832	-0.119	1833	2842	1271	8.36	1842	0.558	1830	-23.9407
1830	-1.579	1256	-0.16	1724.728	26	40	33	1831	-0.085	1832	2767	1266	5.38	1841	0.727	1829	-23.8391
1829	-1.91	1251	-0.102	1722.455	17	60	38.5	1830	0.008	1831	2717	1261	5.03	1840	0.836	1828	-25.3843
1828	-1.37	1246	-0.271	1720.174	51	100	75.5	1829	0.599	1830	2761	1256	4.98	1839	-0.204	1827	-25.9235
1827	-0.144	1241	-0.229	1717.887	46	95	70.5	1828	1.1	1829	2790	1251	4.2	1838	0.893	1826	-23.8175
1826	0.828	1236	0.118	1715.592	97.001	24	60.5005	1827	1.061	1828	2941	1246	4.2	1837	0.166	1825	-23.2865
1825	1.645	1231	0	1713.29	88	62	75	1826	-0.924	1827	2984	1241	5.31	1836	-1.749	1824	-24.2058
1824	1.41	1226	-0.261	1710.98	75	89	82	1825	0.713	1826	2990	1236	6.21	1835	-1.831	1823	-26.4537
1823	2.619	1221	-0.338	1708.663	57	85	71	1824	1.274	1825	2915	1231	6.21	1834	-0.857	1822	-25.3371
1822	2.866	1216	-0.326	1706.338	80	39	59.5	1823	0.258	1824	2828	1226	8.88	1833	-0.368	1821	-24.4901
1821	2.333	1211	-0.045	1704.007	55.999	95	75.4995	1822	-0.451	1823	2746	1221	9.22	1832	-0.32	1820	-24.1758
1820	1.335	1206	-0.313	1701.667	38	22	30	1821	-0.912	1822	2781	1216	9	1831	0.905	1819	-24.7435

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island			Fisher et al., 1998 - Penny Ice Cap, Baffin Island		Fisher, D.A., 2002 - S. Greenland		Fisher, D.A., 2004 - S. Greenland		Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2			pc25yrsp		sgreenpc		del1dye2		Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
1873	35.1954		1873	36.1118	1851	9.42	1855	-25.97	1881	0.46	-37.5	1865	-17.395	1.393				
1872	23.0163		1872	23.4617	1850	9.63	1854	-26.06	1880	0.19	-31.6	1864	-19.855	1.374				
1871	3.8328		1871	37.2877	1849	9.68	1853	-27.1	1879	0.27	-33.5	1863	-18.08	1.2835				
1870	7.6647		1870	62.5043	1848	9.48	1852	-25.27	1878	0.42	-33.1	1862	-17.275	1.4685				
1869	14.5602		1869	23.6179	1847	9.67	1851	-26.54	1877	0.24	-31.6	1861	-20.33	1.4695				
1868	37.0967		1868	18.9607	1846	9.85	1850	-25.2	1876	0.27	-33.4	1860	-19.025	1.3495				
1867	4.1264		1867	18.9227	1845	9.53	1849	-25.82	1875	0.42	-32.4	1859	-18.655	1.2825				
1866	45.6045		1866	35.3756	1844	8.52	1848	-25.05	1874	0.55	-32.4	1858	-19.145	1.317				
1865	38.9541		1865	33.0973	1843	8.93	1847	-24.41	1873	0.27	-31.5	1857	-17.76	1.328				
1864	43.4636		1864	14.1473	1842	9.2	1846	-26.3	1872	0.33	-33	1856	-16.585	1.2525				
1863	41.6131		1863	36.2291	1841	9.85	1845	-25.73	1871	0.56	-31.2	1855	-17.605	1.2195				
1862	29.1741		1862	14.4188	1840	9.8	1844	-26.48	1870	0.48	-34.4	1854	-18.195	1.356				
1861	38.0812		1861	37.1178	1839	9.67	1843	-24.86	1869	0.65	-31.3	1853	-18.32	0.9685				
1860	17.835		1860	17.784	1838	9.48	1842	-25.82	1868	0.33	-36.1	1852	-18.04	1.5715				
1859	46.7823		1859	43.8599	1837	9.2	1841	-27.5	1867	0.2	-32.6	1851	-19.435	1.354				
1858	40.5678		1858	41.1881	1836	9.03	1840	-25.56	1866	0.12	-33.3	1850	-18.525	1.13				
1857	41.9059		1857	39.9752	1835	8.89	1839	-27.09	1865	0.25	-33.5	1849	-19.21	1.495				
1856	18.9577		1856	86.0802	1834	8.85	1838	-25.31	1864	0.17	-35.1	1848	-19.02	0.946				
1855	28.9378		1855	28.4528	1833	8.97	1837	-26.48	1863	0.36	-32.8	1847	-16.29	1.129				
1854	30.6801		1854	63.6195	1832	9.13	1836	-27.6	1862	0.23	-33.9	1846	-17.985	1.366				
1853	47.3062		1853	54.934	1831	9.43	1835	-26.58	1861	0.25	-34.9	1845	-17.355	1.1275				
1852	44.1901		1852	50.4282	1830	9.72	1834	-25.95	1860	0.56	-31	1844	-17.11	1.246				
1851	41.8796		1851	78.9748	1829	9.77	1833	-29.35	1859	0.51	-30.2	1843	-18.185	1.0765				
1850	14.8202		1850	95.3145	1828	9.64	1832	-29.1	1858	0.4	-28.3	1842	-18.82	1.2175				
1849	8.6557		1849	67.9808	1827	9.63	1831	-27.83	1857	0.59	-32.2	1841	-16.365	1.215				
1848	22.657		1848	88.3682	1826	9.72	1830	-27.51	1856	0.56	-32	1840	-18.12	1.01				
1847	15.0521		1847	70.4953	1825	9.86	1829	-26.15	1855	0.3	-34.7	1839	-17.145	1.3745				
1846	10.8041		1846	70.1458	1824	10.04	1828	-25.97	1854	0.44	-34.3	1838	-18.895	1.583				
1845	44.959		1845	53.0033	1823	9.92	1827	-26.6	1853	0.44	-36.9	1837	-19.03	1.3205				
1844	13.2089		1844	43.8521	1822	9.77	1826	-27.44	1852	0.27	-32.8	1836	-17.695	1.1075				
1843	10.7309		1843	84.0939	1821	9.73	1825	-27.18	1851	0.24	-32.3	1835	-18.98	1.47				
1842	6.1142		1842	100	1820	9.7	1824	-25.8	1850	0.4	-32.7	1834	-16.6	0.768				
1841	6.0068				1819	9.79	1823	-25.6	1849	0.23	-28.4	1833	-18.175	1.485				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years	A.D.
								760	-10.455	1881	-142.835	1851	-21.87	1851	-19.21	1851	-25.85	1851	-55.6659	1877	
								750	-10.47	1880	-143.119	1850	-22.67	1850	-20.25	1850	-27.14	1850	-55.7797	1876	
								740	-10.075	1879	-143.119	1849	-21.87	1849	-20.08	1849	-25.33	1849	-55.7797	1875	
								730	-10.385	1878	-143.119	1848	-21.92	1848	-18.77	1848	-25.9	1848	-55.9573	1874	
								720	-9.08	1877	-143.461	1847	-21.92	1847	-19.59	1847	-26.06	1847	-56.1782	1873	
								710	-8.45	1876	-143.466	1846	-21.517	1846	-18.03	1846	-26.26	1846	-55.7295	1872	
								700	-9.52	1875	-143.472	1845	-22.09	1845	-19.45	1845	-24.7	1845	-55.5392	1871	
								690	-11.39	1874	-143.474	1844	-22.21	1844	-19.78	1844	-26.12	1844	-55.5392	1870	
								680	-11.355	1873	-143.474	1843	-22.732	1843	-18.96	1843	-27.7	1843	-55.0895	1869	
								670	-10.225	1872	-143.474	1842	-22.31	1842	-18.54	1842	-26.16	1842	-54.9586	1868	
								660	-9.63	1871	-143.475	1841	-22.554	1841	-19.23	1841	-27.56	1841	-54.9586	1867	
								650	-8.77	1870	-143.478	1840	-22.494	1840	-19.05	1840	-25.41	1840	-54.6957	1866	
								640	-8.74	1869	-143.478	1839	-22.833	1839	-18.1	1839	-24.96	1839	-54.5909	1865	
								630	-8.565	1868	-141.868	1838	-22.685	1838	-18.7	1838	-23.94	1838	-54.3415	1864	
								620	-8.65	1867	-141.072	1837	-22.955	1837	-19.83	1837	-23.47	1837	-53.9818	1863	
								610	-8.655	1866	-140.296	1836	-22.434	1836	-20.2	1836	-25.17	1836	-54.2415	1862	
								600	-8.765	1865	-140.029	1835	-21.606	1835	-18.5	1835	-24.65	1835	-54.5836	1861	
								590	-8.82	1864	-139.788	1834	-21.912	1834	-19.99	1834	-25.13	1834	-54.5836	1860	
								580	-9.395	1863	-139.347	1833	-21.319	1833	-20.08	1833	-26.29	1833	-54.6783	1859	
								570	-9.32	1862	-139.351	1832	-21.594	1832	-18.54	1832	-25.58	1832	-55.1764	1858	
								560	-9.745	1861	-140.007	1831	-22.114	1831	-19.27	1831	-24.16	1831	-55.1764	1857	
								550	-11.58	1860	-140.025	1830	-21.023	1830	-18.9	1830	-25.43	1830	-55.4622	1856	
								540	-10.69	1859	-140.154	1829	-21.819	1829	-20.11	1829	-28.85	1829	-55.6432	1855	
								530	-10.71	1858	-140.154	1828	-21.676	1828	-18.61	1828	-25.78	1828	-55.6432	1854	
								520	-10.785	1857	-140.689	1827	-21.978	1827	-16.35	1827	-25.67	1827	-55.924	1853	
								510	-10.91	1856	-140.817	1826	-22.238	1826	-17.86	1826	-25.26	1826	-56.003	1852	
								500	-11.095	1855	-140.817	1825	-21.717	1825	-19.52	1825	-24.84	1825	-55.8268	1851	
								490	-11.205	1854	-140.92	1824	-22.767	1824	-20.26	1824	-24.71	1824	-55.7712	1850	
								480	-12.255	1853	-141.509	1823	-23.101	1823	-20.22	1823	-27.17	1823	-55.7234	1849	
								470	-12.1	1852	-141.509	1822	-22.152	1822	-18.61	1822	-26.64	1822	-55.656	1848	
								460	-12.005	1851	-141.54	1821	-23.267	1821	-20.12	1821	-24.74	1821	-55.656	1847	
										1850	-142.37	1820	-22.636	1820	-21.08	1820	-24.63	1820	-55.5585	1846	
										1849	-142.37	1819	-21.496	1819	-18.44	1819	-25.96	1819	-55.4728	1845	

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delta D mean annual	siple210.ant		Fisher, D.A.., 2002 - Siple Dome, Antarctica O-18	Year	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-294.4	1851	-29.7435		1875	-438.5	2.4	1868	0.17303			1851	1.168
-294.6	1850	-29.7435		1874	-438.7	2.4	1867	0.22846			1850	1.65
-307.3	1849	-29.7435		1873	-439.6	2.5	1866	0.19718			1849	-0.201
-299.7	1848	-29.7928		1872	-439.9	2.3	1865	0.22909			1848	-0.578
-259.9	1847	-29.8709		1871	-440.1	2.6	1864	0.22153			1847	2.065
-269.6	1846	-29.8709		1870	-440.3	2.5	1863	0.26961			1846	0.196
-284.6	1845	-29.8709		1869	-440.3	2.7	1862	0.2462			1845	-0.324
-303.4	1844	-29.7758		1868	-440.2	2.4	1861	0.18289			1844	-1.042
-295.7	1843	-29.712		1867	-439.4	2.7	1860	0.27885			1843	1.534
-285.2	1842	-29.712		1866	-438.8	2.6	1859	0.28736			1842	-0.672
-291.4	1841	-29.6832		1865	-438.8	2.5	1858	0.26394			1841	0.766
-302.8	1840	-29.6444		1864	-439.3	2.6	1857	0.20819			1840	1.096
-281.7	1839	-29.6444		1863	-439.0	2.6	1856	0.1684			1839	-1.529
-273.5	1838	-29.5906		1862	-438.3	2.6	1855	0.3536			1838	0.66
-287.8	1837	-29.5882		1861	-437.3	2.4	1854	0.26572			1837	0.187
-295.9	1836	-29.5684		1860	-436.5	2.2	1853	0.2904			1836	-1.08
-299.2	1835	-29.5322		1859	-437.3	2.3	1852	0.202			1835	-2.195
-285.8	1834	-29.5322		1858	-437.8	2.3	1851	0.27517			1834	-1.425
-287.6	1833	-29.4835		1857	-438.7	2.5	1850	0.24315			1833	-1.207
-294.2	1832	-29.4304		1856	-440.2	2.1	1849	0.24357			1832	0.5
-287.2	1831	-29.4304		1855	-441.4	2.1	1848	0.22762			1831	1.345
-287.7	1830	-29.3667		1854	-442.9	2.2	1847	0.29323			1830	1.067
-279.3	1829	-29.3227		1853	-443.5	2.2	1846	0.22027			1829	2.188
-274.1	1828	-29.3118		1852	-444.6	2.1	1845	0.21239			1828	0.36
-291.9	1827	-29.2264		1851	-445.7	2.2	1844	0.14719			1827	-0.389
-272.7	1826	-29.2264		1850	-446.8	2.2	1843	0.25386			1826	-1.928
-294.7	1825	-29.303		1849	-448.0	2.3	1842	0.2379			1825	-1.524
-298.6	1824	-29.3254		1848	-448.6	2.2	1841	0.20536			1824	1.952
-283.6	1823	-29.3254		1847	-450.4	2.2	1840	0.15622			1823	-0.246
-264.6	1822	-29.3254		1846	-451.4	2.1	1839	0.32127			1822	-1.309
-254.4	1821	-29.4531		1845	-451.9	2.2	1838	0.17323			1821	0.412
-260.1	1820	-29.5496		1844	-452.4	2.1	1837	0.32232			1820	0.206
-282.1	1819	-29.5496		1843	-452.7	2.0	1836	0.2566			1819	-1.347

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1819	0.214	1201	-0.379	1699.32	52.001	38	45.0005	1820	0.567	1821	2874	1211	7.84	1830	0.144	1818	-24.5119
1818	-1.276	1196	-0.072	1696.966	54	46	50	1819	-0.087	1820	2883	1206	7.84	1829	0.34	1817	-24.2065
1817	-2.376	1191	-0.461	1694.604	21.999	19	20.4995	1818	-1.008	1819	2820	1201	6.91	1828	0.848	1816	-26.6728
1816	-2.031	1186	-0.367	1692.234	30.001	41	35.5005	1817	-0.798	1818	2812	1196	5.51	1827	0.451	1815	-26.2842
1815	-0.889	1181	-0.332	1689.857	44	32	38	1816	0.772	1817	2838	1191	5.51	1826	-0.631	1814	-24.5076
1814	-0.426	1176	0.068	1687.472	78	74	76	1815	0.455	1816	2906	1186	15.57	1825	0.069	1813	-24.1594
1813	-0.79	1171	0.662	1685.079	91	94	92.5	1814	0.259	1815	2906	1181	22.1	1824	-0.522	1812	-24.5806
1812	-1.424	1166	0.14	1682.678	55.999	76	65.9995	1813	-0.592	1814	2817	1176	21.1	1823	-0.141	1811	-25.5817
1811	-1.963	1161	0.446	1680.27	62.001	84	73.0005	1812	-1.174	1813	2718	1171	7.08	1822	0.447	1810	-23.3711
1810	-2.382	1156	0.563	1677.854	91	100	95.5	1811	-0.16	1812	2694	1166	2.78	1821	-0.243	1809	-25.4865
1809	-2.118	1151	0.492	1675.429	35	66	50.5	1810	0.528	1811	2847	1161	2.79	1820	0.95	1808	-24.2589
1808	-0.936	1146	-0.025	1672.997	49	84	66.5	1809	-0.706	1810	3007			1819	0.246	1807	-25.6182
1807	-0.336	1141	1.912	1670.557	34.999	34	34.4995	1808	0.856	1809	2990			1818	-0.749	1806	-26.5526
1806	-0.261	1136	0.687	1668.11	27.001	73	50.0005	1807	0.285	1808	2877			1817	-1.021	1805	-25.0201
1805	-0.005	1131	0.929	1665.654	36.999	24	30.4995	1806	0.938	1807	2769			1816	-0.529	1804	-26.118
1804	0.544	1126	0.568	1663.19	43.001	40	41.5005	1805	0.484	1806	2715			1815	0.072	1803	-25.1058
1803	-0.5	1121	-0.213	1660.717	20.999	36	28.4995	1804	0.711	1805	2726			1814	-0.371	1802	-24.5262
1802	-1.42	1116	-0.054	1658.237	31.001	38	34.5005	1803	0.324	1804	2806			1813	-0.783	1801	-25.346
1801	-1.645	1111	-0.322	1655.749	33	33	33	1802	0.628	1803	2845			1812	-0.06	1800	-23.8451
1800	-1.36	1106	-0.448	1653.252	64	37	50.5	1801	-0.547	1802	2807			1811	-0.242	1799	-24.5775
1799	-0.911	1101	-0.316	1650.747	48	55	51.5	1800	-0.842	1801	2745			1810	-0.21	1798	-24.3736
1798	-0.684	1096	0.152	1648.234	63	86	74.5	1799	-0.797	1800	2821			1809	0.554	1797	-23.0521
1797	-0.907	1091	-0.26	1645.713	84	25	54.5	1798	-0.389	1799	2789			1808	0.407	1796	-24.1805
1796	-1.427	1086	-0.15	1643.183	17	44	30.5	1797	-0.042	1798	2705			1807	0.104	1795	-25.9831
1795	-0.829	1081	-0.254	1640.645	29	17	23	1796	-0.694	1797	2720			1806	-0.019	1794	-24.0485
1794	-0.733	1076	-0.15	1638.099	70	67	68.5	1795	-0.76	1796	2771			1805	0.84	1793	-23.5937
1793	-1.079	1071	-0.439	1635.544	81	53	67	1794	-0.524	1795	2834			1804	0.974	1792	-23.7792
1792	-1.231	1066	0.016	1632.98	63.001	94	78.5005	1793	-0.48	1794	2898			1803	-0.529	1791	-24.254
1791	-1.223	1061	0.044	1630.408	33.999	60	46.9995	1792	0.422	1793	2921			1802	-1.739	1790	-24.3899
1790	-0.58	1056	-0.13	1627.828	60.001	81	70.5005	1791	0.148	1792	2935			1801	0.538	1789	-23.4479
1789	0.176	1051	-0.45	1625.238	99	36	67.5	1790	0.71	1791	2839			1800	0.622	1788	-24.2136
1788	0.978	1046	0.008	1622.641	87	43	65	1789	0.727	1790	2800			1799	-0.102	1787	-24.9056
1787	1.04	1041	-0.142	1620.034	18.001	38	28.0005	1788	1.424	1789	2838			1798	-0.805	1786	-25.2464

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2	
1840	4.0171
1839	22.3641
1838	74.6951
1837	34.5343
1836	48.0962
1835	40.3692
1834	0.001
1833	52.3442
1832	55.7048
1831	52.1489
1830	33.2038
1829	48.2549
1828	17.286
1827	39.295
1826	28.0159
1825	5.9885
1824	21.0823
1823	18.1649
1822	4.6885
1821	4.7007
1820	30.6159
1819	30.4328
1818	30.9455
1817	56.8486
1816	31.2995
1815	19.3245
1814	8.0087
1813	11.2558
1812	20.0936
1811	4.6396
1810	71.3992
1809	46.5582
1808	30.2497

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp	

Fisher, D.A., 2002 - S. Greenland

sgreenpc	
1818	9.72
1817	9.59
1816	9.35
1815	9.29
1814	9.23
1813	9.3
1812	9.63
1811	10.21
1810	10.14
1809	9.88
1808	9.56
1807	9.67
1806	9.86
1805	10.09
1804	10.22
1803	10.03
1802	9.86
1801	9.92
1800	10.05
1799	10.1
1798	9.97
1797	9.83
1796	9.72
1795	9.96
1794	10.07
1793	10.15
1792	10.24
1791	10.35
1790	10.67
1789	10.77
1788	10.7
1787	10.51
1786	10.13

Fisher, D.A., 2004 - S. Greenland

del1dye2	
1822	-26.98
1821	-26.75
1820	-24.7
1819	-25.2
1818	-25.7
1817	-25.88
1816	-27.66
1815	-25.63
1814	-26.08
1813	-28.34
1812	-29.09
1811	-26.7
1810	-24.91
1809	-25.66
1808	-25.06
1807	-25.16
1806	-26.02
1805	-25.16
1804	-25.79
1803	-26.69
1802	-26.69
1801	-26.24
1800	-25.67
1799	-25.99
1798	-27.94
1797	-27.8
1796	-25.99
1795	-26.33
1794	-26.4
1793	-26.29
1792	-27.05
1791	-25.05
1790	-27.27

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)
1848	0.43	-30.7
1847	0.37	-30.7
1846	0.34	-30.5
1845	0.26	-29.9
1844	0.29	-29.8
1843	0.24	-31.8
1842	0.29	-32.1
1841	0.4	-33.5
1840	0.23	-29.8
1839	0.35	-29.4
1838	0.28	-31.1
1837	0.48	-26.8
1836	0.39	-30.6
1835	0.33	-31.2
1834	0.44	-33.4
1833	0.44	-30.3
1832	0.39	-31.5
1831	0.24	-24.8
1830	0.38	-30.7
1829	0.38	-31.4
1828	0.31	-32.8
1827	0.58	-30.4
1826	0.64	-31.5
1825	0.4	-29.6
1824	0.19	-31.3
1823	0.23	-30.9
1822	0.32	-30.4
1821	0.28	-25.8
1820	0.18	-31.7
1819	0.27	-34.3
1818	0.37	-32.8
1817	0.22	-29.7
1816	0.27	-33.2

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1832	-17.925	0.9505
1831	-19.065	1.376
1830	-17.595	1.2535
1829	-16.06	1.247
1828	-17.415	1.2955
1827	-17.305	0.9925
1826	-14.465	1.3105
1825	-19.075	1.382
1824	-19.495	1.081
1823	-18.24	1.35
1822	-19.06	0.957
1821	-17.385	1.111
1820	-23.71	1.439
1819	-19.61	1.201
1818	-20.22	1.345
1817	-20.83	1.178
1816	-20.755	1.1815
1815	-19.805	1.4555
1814	-19.015	0.9975
1813	-19.56	1.415
1812	-18.075	1.174
1811	-19.2	1.197
1810	-20.42	0.9515
1809	-18.845	1.113
1808	-18.865	1.348
1807	-21.205	1.3465
1806	-17.355	1.1365
1805	-15.67	0.9485
1804	-17.565	1.424
1803	-19.435	0.874
1802	-19.3	1.534
1801	-17.385	0.964
1800	-17.16	1.3395

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years	A.D.
										1848	-142.847	1818	-21.868	1818	-17.99	1818	-24.58	1818	-55.4303	1844	
										1847	-143.147	1817	-22.987	1817	-21.25	1817	-26.27	1817	-55.2509	1843	
										1846	-143.147	1816	-23.079	1816	-19.14	1816	-25.57	1816	-55.2509	1842	
										1845	-143.252	1815	-22.703	1815	-20.98	1815	-25	1815	-55.0481	1841	
										1844	-144.238	1814	-22.152	1814	-21.49	1814	-25.01	1814	-54.7864	1840	
										1843	-144.238	1813	-22.042	1813	-19.85	1813	-25.75	1813	-54.7864	1839	
										1842	-144.371	1812	-21.707	1812	-20.96	1812	-26.3	1812	-54.2253	1838	
										1841	-145.214	1811	-21.707	1811	-19.09	1811	-25.9	1811	-54.1859	1837	
										1840	-145.214	1810	-22.41	1810	-18.53	1810	-25.25	1810	-53.7033	1836	
										1839	-145.399	1809	-21.852	1809	-18.92	1809	-25.89	1809	-53.6049	1835	
										1838	-145.532	1808	-22.698	1808	-19.28	1808	-27.4	1808	-53.3012	1834	
										1837	-145.392	1807	-23.317	1807	-19.23	1807	-25.77	1807	-53.0919	1833	
										1836	-145.02	1806	-23.169	1806	-19.34	1806	-25.09	1806	-53.0919	1832	
										1835	-144.414	1805	-22.216	1805	-22.29	1805	-25.81	1805	-53.7369	1831	
										1834	-144.191	1804	-22.334	1804	-20.57	1804	-24.93	1804	-53.7718	1830	
										1833	-143.684	1803	-24.225	1803	-18.21	1803	-24.97	1803	-54.1538	1829	
										1832	-143.684	1802	-21.995	1802	-19.32	1802	-25.96	1802	-54.3801	1828	
										1831	-143.314	1801	-21.424	1801	-18.93	1801	-26.73	1801	-54.8889	1827	
										1830	-143.263	1800	-22.922	1800	-20.36	1800	-26.57	1800	-54.9928	1826	
										1829	-143.263	1799	-21.997	1799	-17.74	1799	-24.42	1799	-55.3552	1825	
										1828	-143.263	1798	-22.32	1798	-19.25	1798	-25.62	1798	-55.579	1824	
										1827	-144.494	1797	-23.575	1797	-20.72	1797	-26.76	1797	-55.7152	1823	
										1826	-144.867	1796	-21.837	1796	-19.44	1796	-23.55	1796	-55.6663	1822	
										1825	-144.868	1795	-22.485	1795	-20.5	1795	-25.59	1795	-54.8143	1821	
										1824	-144.871	1794	-21.998	1794	-19.5	1794	-24.75	1794	-54.8143	1820	
										1823	-144.871	1793	-22.313	1793	-19.5	1793	-24.8	1793	-54.6511	1819	
										1822	-144.358	1792	-22.543	1792	-19.5	1792	-26.14	1792	-54.136	1818	
										1821	-144.075	1791	-21.613	1791	-19.5	1791	-25.7	1791	-53.3554	1817	
										1820	-143.607	1790	-21.758	1790	-19.5	1790	-26.51	1790	-53.1772	1816	
										1819	-143.25	1789	-22.122	1789	-19.5	1789	-26.37	1789	-53.1772	1815	
										1818	-143.252	1788	-22.408	1788	-19.5	1788	-26.45	1788	-52.9839	1814	
										1817	-143.305	1787	-22.839	1787	-19.5	1787	-25.26	1787	-52.5571	1813	
										1816	-143.457	1786	-22.808	1786	-19.5	1786	-24.96	1786	-53.2159	1812	

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delta D mean annual	siple210.ant	O-18
-279.5	1818	-29.5825
-276.6	1817	-29.6025
-291.5	1816	-29.6025
-292.5	1815	-29.6025
-284.4	1814	-29.38
-282.4	1813	-29.3689
-278.9	1812	-29.2629
-285.5	1811	-29.2212
-292.2	1810	-29.1419
-299.8	1809	-29.0049
-295.6	1808	-29.0049
-293	1807	-28.8875
-303.2	1806	-28.8689
-299.2	1805	-28.8689
-280.3	1804	-29.1007
-269.7	1803	-29.2016
-273.1	1802	-29.2403
-288	1801	-29.414
-295.1	1800	-29.4824
-287.9	1799	-29.6266
-285.1	1798	-29.6266
-287	1797	-29.8279
-277.8	1796	-29.8847
-268.5	1795	-29.7994
-272.9	1794	-29.7772
-264.8	1793	-29.7772
-262.8	1792	-29.6329
-286.9	1791	-29.618
-314.9	1790	-29.5244
-327.1	1789	-29.4821
-307	1788	-29.4821
-282	1787	-29.4449
-280.9	1786	-29.3857

Fisher, D.A.., 2002 - Siple Dome, Antarctica

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1
1842	-452.9	1.8
1841	-453.1	1.9
1840	-453.1	1.8
1839	-452.5	2.0
1838	-451.4	2.0
1837	-449.9	1.9
1836	-448.0	1.7
1835	-446.3	1.8
1834	-444.9	2.0
1833	-443.8	1.9
1832	-443.4	2.0
1831	-443.2	2.0
1830	-442.9	2.0
1829	-442.8	2.0
1828	-442.8	1.9
1827	-442.6	1.8
1826	-442.0	2.1
1825	-442.3	2.3
1824	-443.9	2.3
1823	-445.0	2.2
1822	-445.4	2.2
1821	-444.4	2.4
1820	-442.8	2.5
1819	-441.1	2.5
1818	-440.6	2.6
1817	-441.1	2.6
1816	-442.6	2.6
1815	-444.9	2.8
1814	-445.7	2.6
1813	-445.2	2.5
1812	-444.9	2.6
1811	-445.1	2.7
1810	-446.1	2.4

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1835	0.18227
1834	0.21576
1833	0.23266
1832	0.29965
1831	0.28348
1830	0.3175
1829	0.37683
1828	0.29367
1827	0.3026
1826	0.18511
1825	0.29504
1824	0.22785
1823	0.19435
1822	0.25389
1821	0.21179
1820	0.24612
1819	0.28046
1818	0.20423
1817	0.22155
1816	0.15351
1815	0.23059
1814	0.17095
1813	0.23962
1812	0.18849
1811	0.25747
1810	0.29224
1809	0.27545
1808	0.32777
1807	0.23327
1806	0.22488
1805	0.25116
1804	0.1561
1803	0.36486

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1818	-2.626
1817	-2.406
1816	1.21
1815	-0.342
1814	-1.69
1813	-1.086
1812	0.93
1811	-0.254
1810	-0.105
1809	1.845
1808	2.246
1807	1.778
1806	1.24
1805	0.394
1804	0.806
1803	0.179
1802	-0.246
1801	1.492
1800	1.379
1799	0.708
1798	-0.454
1797	1.61
1796	0.272
1795	1.646
1794	-2.443
1793	-0.568
1792	0.737
1791	-1.142
1790	-0.268
1789	1.981
1788	0.26
1787	2.021
1786	0.975

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992				Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1786	0.194	1036	-0.532	1617.419	24.999	58	41.4995	1787	0.742	1788	2846			1797	-0.793	1785	-25.3803
1785	-1.241	1031	-0.619	1614.795	38	26	32	1786	-0.811	1787	2799			1796	-0.151	1784	-23.366
1784	-1.698	1026	0.136	1612.162	82	20	51	1785	-0.631	1786	2779			1795	0.129	1783	-24.2003
1783	-2.062	1021	0.241	1609.52	66	62	64	1784	-1.016	1785	2756			1794	0.353	1782	-23.0678
1782	-2.278	1016	-0.482	1606.87	34	24	29	1783	-0.215	1784	2849			1793	-0.786	1781	-23.3496
1781	-2.53	1011	-0.246	1604.21	24	48	36	1782	0.27	1783	2825			1792	0.506	1780	-22.2599
1780	-2.494	1006	-0.431	1601.542	53	34	43.5	1781	-0.29	1782	2728			1791	0.754	1779	-23.0745
1779	-2.196	1001	-0.483	1598.864	47	67	57	1780	-0.447	1781	2680			1790	0.056	1778	-26.1317
1778	-1.71	996	-0.341	1596.178	70	80	75	1779	-0.4	1780	2737			1789	-0.042	1777	-23.4501
1777	-1.625	991	-0.558	1593.482	61	75	68	1778	0.174	1779	2882			1788	0.068	1776	-23.9768
1776	0.176	986	-0.489	1590.778	62	23	42.5	1777	-0.18	1778	2879			1787	0.699	1775	-25.8986
1775	1.493	981	-0.504	1588.064	75	29	52	1776	0.54	1777	2825			1786	1.451	1774	-23.2491
1774	-0.199	976	-0.328	1585.341	42.5	38	40.25	1775	0.857	1776	2849			1785	0.508	1773	-24.6231
1773	-0.122	971	-0.516	1582.608	34	99	66.5	1774	0.676	1775	2777			1784	-0.244	1772	-25.0309
1772	-0.211	966	-0.362	1579.866	51.5	25	38.25	1773	1.293	1774	2724			1783	-0.022	1771	-22.9596
1771	0.186	961	-0.514	1577.115	69	50	59.5	1772	-0.264	1773	2700			1782	0.117	1770	-24.2278
1770	0.654	956	-0.402	1574.355	46	48	47	1771	-0.934	1772	2695			1781	0.199	1769	-23.1084
1769	0.679	951	-0.434	1571.585	53.5	.		1770	-0.789	1771	2689			1780	-0.544	1768	-24.0868
1768	0.062	946	0.045	1568.806	57	.		1769	-1.029	1770	2746			1779	-0.862	1767	-25.7901
1767	-0.506	941	0.328	1566.017	21.501	.		1768	-1.817	1769	2805			1778	-1.065	1766	-25.546
1766	-0.902	936	-0.001	1563.219	42.999	.		1767	-0.811	1768	2744			1777	-0.562	1765	-24.7946
1765	-1.131	931	0.477	1560.411	38.001	.		1766	-0.26	1767	2633			1776	0.589	1764	-24.5009
1764	-0.743	926	-0.142	1557.593	63.999	.		1765	0.512	1766	2595			1775	0.811	1763	-24.2003
1763	-0.53	921	-0.656	1554.766	24.502	.		1764	0.743	1765	2685			1774	0.379	1762	-23.07
1762	-0.446	916	-0.502	1551.928	31.399	.		1763	-0.064	1764	2800			1773	-0.026	1761	-23.35
1761	-0.418	911	-0.463	1549.082	80.5	.		1762	0.812	1763	2828			1772	0.623		
1760	0.542	906	-0.538	1546.225	65	.		1761	0.626	1762	2874			1771	0.546		
1759	1.298	901	0.479	1543.358	65	.				1761	2942			1770	-0.656		
1758	0.161	896	0.186	1540.482	27.499	.				1760	2955			1769	-0.299		
1757	-0.848	891	-0.17	1537.595	94	.				1759	2799			1768	-0.103		
1756	-1.641	886	-0.207	1534.699	75	.				1758	2864			1767	-0.254		
1755	-2.383	881	0.124	1531.792	38.499	.				1757	3008			1766	0.485		
1754	-1.914	876	0.014	1528.876	100	.				1756	2953			1765	0.223		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2	
1807	53.7724
1806	0.001
1805	27.1003
1804	12.9403
1803	18.3358
1802	19.0438
1801	17.4691
1800	40.7599
1799	26.4168
1798	20.1178
1797	91.4979
1796	2.4546
1795	100
1794	100
1793	7.3129
1792	87.4269
1791	46.9854
1790	41.6021
1789	13.6727
1788	68.6649
1787	25.8624
1786	43.4355
1785	26.4778
1784	25.6721
1783	40.2838
1782	24.5613
1781	37.2687
1780	41.3903
1779	31.9831
1778	22.0686
1777	9.5468
1776	1.5391
1775	16.4681

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp

Fisher, D.A., 2002 - S. Greenland

sgreenpc	
1785	9.88
1784	9.63
1783	9.82
1782	10.08
1781	10.04
1780	9.95
1779	9.88
1778	9.88
1777	9.88
1776	9.88
1775	9.91
1774	9.94
1773	9.93
1772	9.85
1771	9.58
1770	9.6
1769	9.71
1768	9.9
1767	10.21
1766	10.34
1765	10.01
1764	9.67
1763	9.51
1762	9.41
1761	9.35

Fisher, D.A., 2004 - S. Greenland

del1dye2	
1789	-27.03
1788	-25.13
1787	-26.77
1786	-26.23
1785	-25.81
1784	-27.29
1783	-27
1782	-25.73
1781	-27.18
1780	-28.69
1779	-27.1
1778	-26.66
1777	-26.94
1776	-24.7
1775	-28.06
1774	-26.32
1773	-26.96
1772	-24.71
1771	-26.29
1770	-27.52
1769	-25.84
1768	-26.17
1767	-26.39
1766	-27.16
1765	-26.28
1764	-25.01
1763	-26.71
1762	-29.23
1761	-24.57
1760	-26.42
1759	-26.01
1758	-26.36
1757	-26.05

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)
1815	0.47	-31.7
1814	0.25	-31.6
1813	0.26	-28.9
1812	0.38	-31.8
1811	0.16	-32.4
1810	0.36	-31.6
1809	0.26	-33
1808	0.26	-25.8
1807	0.26	-27.5
1806	0.26	-27.6
1805	0.27	-32.8
1804	0.27	-30.6
1803	0.27	-34.1
1802	0.41	-30.3
1801	0.41	-30.5
1800	0.2	-31.1
1799	0.46	-31.7
1798	0.24	-29.4
1797	0.35	-33.3
1796	0.36	-28.6
1795	0.43	-28.8
1794	0.21	-28.8
1793	0.29	-30.8
1792	0.15	-33.9
1791	0.29	-33.2
1790	0.15	-34.1
1789	0.29	-34.5
1788	0.27	-34.5
1787	0.18	-30.8
1786	0.31	-29.5
1785	0.31	-30.2
1784	0.31	-29.9
1783	0.39	-31.2

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1799	-20.495	1.381
1798	-19.72	1.332
1797	-19.83	1.0485
1796	-17.145	1.3005
1795	-17.155	1.1585
1794	-16.33	1.192
1793	-16.485	1.216
1792	-16.995	1.024
1791	-18.7	1.197
1790	-19.64	1.4975
1789	-18.545	1.071
1788	-18.745	1.1335
1787	-19.44	1.1475
1786	-19.57	1.433
1785	-17.385	1.172
1784	-16.555	1.117
1783	-18.105	1.3165
1782	-18.015	1.153
1781	-18.27	1.15
1780	-20.915	1.1965
1779	-20.235	1.2735
1778	-18.4	1.2405
1777	-19.62	1.267
1776	-20.48	1.2805
1775	-18.495	1.465
1774	-17.865	1.135
1773	-18.785	1.11
1772	-17.58	1.2335
1771	-17.61	0.833
1770	-18.63	1.6945
1769	-19.93	1.0245
1768	-19.715	0.869
1767	-16.775	1.127

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant		plato210.ant	O-18	Years A.D.
										1815	-143.457	1785	-22.518	1785	-19.5	1785	-25.25	1785	-53.6253	1811
										1814	-143.806	1784	-23.221	1784	-19.5	1784	-25.62	1784	-53.6253	1810
										1813	-143.975	1783	-20.922	1783	-19.5	1783	-25.96	1783	-54.2593	1809
										1812	-144.039	1782	-21.485	1782	-19.5	1782	-25.52	1782	-54.2765	1808
										1811	-144.607	1781	-22.993	1781	-19.5	1781	-25.19	1781	-54.2765	1807
										1810	-144.608	1780	-21.93	1780	-19.5	1780	-24.48	1780	-54.895	1806
										1809	-144.61	1779	-21.95	1779	-19.5	1779	-26.02	1779	-54.976	1805
										1808	-144.121	1778	-21.864	1778	-19.5	1778	-26.1	1778	-55.1039	1804
										1807	-143.5	1777	-22.009	1777	-19.5	1777	-25.11	1777	-55.3457	1803
										1806	-143.438	1776	-21.888	1776	-19.5	1776	-25.26	1776	-55.3457	1802
										1805	-142.703	1775	-21.227	1775	-19.5	1775	-26.37	1775	-55.009	1801
										1804	-142.44	1774	-20.708	1774	-19.5	1774	-25.42	1774	-54.9781	1800
										1803	-142.221	1773	-22.502	1773	-19.5	1773	-25.34	1773	-54.6617	1799
										1802	-142.186	1772	-21.84	1772	-19.5	1772	-25.88	1772	-54.5232	1798
										1801	-142.052	1771	-21.948	1771	-19.5	1771	-24.8	1771	-54.4763	1797
										1800	-142.586	1770	-21.336	1770	-19.5	1770	-25.09	1770	-54.2817	1796
										1799	-143.002	1769	-21.771	1769	-19.5	1769	-25.89	1769	-54.2817	1795
										1798	-143.002	1768	-21.793	1768	-19.5	1768	-26.14	1768	-54.1199	1794
										1797	-143.002	1767	-21.145	1767	-19.5	1767	-25.78	1767	-54.1301	1793
										1796	-142.871	1766	-21.434	1766	-19.5	1766	-24.66	1766	-54.1385	1792
										1795	-142.434	1765	-22.131	1765	-19.5	1765	-25.44	1765	-54.1385	1791
										1794	-142.221	1764	-21.506	1764	-19.5	1764	-26.29	1764	-54.1385	1790
										1793	-141.912	1763	-22.181	1763	-19.5	1763	-24.73	1763	-54.2323	1789
										1792	-142.784	1762	-21.619	1762	-19.5	1762	-25.25	1762	-54.3	1788
										1791	-142.784	1761	-23.572	1761	-19.5	1761	-24.81	1761	-54.3	1787
																				1786
																				1785
																				1784
																				1783
																				1782
																				1781
																				1780
																				1779

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS - Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-290.4	1785	-29.4454	1809	-447.5	2.5	1802	0.27842			1785	1.973
-293.5	1784	-29.7129	1808	-448.9	2.4	1801	0.20037			1784	1.252
-286.4	1783	-29.7129	1807	-449.4	2.4	1800	0.20059			1783	-0.373
-282.5	1782	-29.7346	1806	-449.3	2.3	1799	0.22708			1782	-0.358
-285.8	1781	-29.8914	1805	-448.6	2.4	1798	0.16604			1781	-0.816
-287.1	1780	-29.8914	1804	-446.9	2.1	1797	0.36785			1780	1.132
-283.7	1779	-29.9335	1803	-446.3	2.0	1796	0.25436			1779	-0.336
-278.1	1778	-30.1498	1802	-446.6	2.2	1795	0.27235			1778	-0.797
-288.4	1777	-30.1498	1801	-446.5	2.0	1794	0.29918			1777	-0.351
-296	1776	-29.9737	1800	-446.2	2.1	1793	0.16736			1776	1.287
-293.3	1775	-29.8708	1799	-445.4	2.1	1792	0.26463			1775	1.893
-301.5	1774	-29.8708	1798	-444.0	1.9	1791	0.2208			1774	0.083
-292.7	1773	-29.7355	1797	-443.0	1.9	1790	0.20336			1773	0.829
-298.8	1772	-29.5575	1796	-442.3	1.8	1789	0.22125			1772	1.44
-298.3	1771	-29.5575	1795	-441.7	1.7	1788	0.23041			1771	-0.098
-283.4	1770	-29.4194	1794	-441.4	1.9	1787	0.2218			1770	-0.008
-278.4	1769	-29.1752	1793	-441.0	1.8	1786	0.21319			1769	0.438
-282.7	1768	-29.1166	1792	-439.7	1.8	1785	0.27579			1768	-0.06
-290.2	1767	-28.9192	1791	-437.3	1.7	1784	0.43698			1767	0.22
-286.2	1766	-28.9192	1790	-436.0	1.7	1783	0.21429			1766	0.491
-283.1	1765	-28.9192	1789	-435.3	1.8	1782	0.21452			1765	0.858
-276.5	1764	-29.2036	1788	-435.2	1.8	1781	0.17897			1764	-0.178
-275.1	1763	-29.2923	1787	-436.0	1.8	1780	0.2419			1763	0.285
-291.5	1762	-29.2923	1786	-436.9	1.9	1779	0.21519			1762	0.561
-303.3	1761	-29.466	1785	-437.4	1.8	1778	0.26046			1761	-2.921
-317.8			1784	-437.9	1.9	1777	0.17975			1760	1.208
-324.7			1783	-438.4	1.8	1776	0.25196			1759	-0.96
-314.2			1782	-439.8	1.9	1775	0.18914			1758	0.318
-295.5			1781	-440.7	1.9	1774	0.24357			1757	-1.108
-281.7			1780	-441.5	1.9	1773	0.30718			1756	-2.277
-290.9			1779	-441.6	2.0	1772	0.27141			1755	0.912
-296.1						1771	0.21731			1754	-1.132
-294.6						1770	0.18131			1753	0.635

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1753	-1.865	871	-0.479	1525.949	53	.				1755	2817			1764	1.255		
1752	-1.85	866	-0.477	1523.012	75.5	.				1754	2672			1763	0.722		
1751	-1.261	861	-0.551	1520.065	100	.				1753	2764			1762	0.507		
1750	-0.696	856	-0.38	1517.107	86	.				1752	2855			1761	-1.145		
1749	-0.008	851	-0.131	1514.139	83.999	.				1751	2866			1760	-0.027		
1748	1.399	846	-0.254	1511.161	44.5	.				1750	2807			1759	-0.433		
1747	2.701	841	-0.499	1508.172	76.5	.				1749	2792			1758	-0.634		
1746	2.731	836	-0.318	1505.173	89	.				1748	2877			1757	-0.752		
1745	2.161	831	-0.292	1502.163	56.999	.				1747	2959			1756	-0.262		
1744	2.103	826	-0.503	1499.143	32.5	.				1746	2917			1755	-0.164		
1743	2.927	821	-0.411	1496.112	25.501	.				1745	2810			1754	-0.145		
1742	4.011	816	-0.23	1493.07	43	.				1744	2758			1753	0.155		
1741	4.605	811	-0.188	1490.018	31.8	.				1743	2697			1752	-0.462		
1740	5.044	806	-0.303	1486.955	55.5	.				1742	2730			1751	-0.24		
1739	4.052	801	-0.059	1483.881	35	.				1741	2838			1750	-0.395		
1738	2.947	796	-0.225	1480.796	98	.				1740	2872			1749	-0.315		
1737	0.761	791	-0.6	1477.7	65	.				1739	2823			1748	0.09		
1736	-0.363	786	-0.372	1474.593	52.3	.				1738	2832			1747	-0.234		
1735	1.526	781	-0.52	1471.476	55	.				1737	2795			1746	-0.24		
1734	2.969	776	-0.449	1468.347	79	.				1736	2735			1745	-0.341		
1733	5.164	771	-0.39	1465.207	77.5	.				1735	2748			1744	-0.105		
1732	6.039	766	-0.438	1462.055	92.999	.				1734	2766			1743	0.262		
1731	6.238	761	-0.292	1458.893	69	.				1733	2835			1742	-0.019		
1730	7.327	756	-0.541	1455.719	59.3	.				1732	2870			1741	0.756		
1729	7.162	751	-0.226	1452.534	63.3	.				1731	2846			1740	1.293		
1728	4.798	746	-0.511	1449.337	85.3	.				1730	2827			1739	0.458		
1727	3.605	741	-0.493	1446.129	61	.				1729	2786			1738	-0.742		
1726	2.319	736	-0.415	1442.91	54.999	.				1728	2812			1737	-1.317		
1725	1.354	731	-0.527	1439.679	54	.				1727	2828			1736	0.041		
1724	1.255	726	-0.47	1436.436	73.5	.				1726	2742			1735	-1.431		
1723	0.93	721	-0.326	1433.182	87.501	.				1725	2805			1734	-0.57		
1722	1.547	716	0.624	1429.916	50.999	.				1724	2824			1733	0.683		
1721	3.068	711	-0.192	1426.638	31.3	.				1723	2852			1732	0.4		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2	
1774	41.303
1773	47.5469
1772	11.9638
1771	36.3844
1770	6.3952
1769	30.8454
1768	21.4119
1767	0.3916
1766	8.723
1765	20.7894
1764	3.5288
1763	20.3011
1762	29.7737
1761	67.9639
1760	55.1274
1759	30.5427
1758	27.9548
1757	37.2161
1756	26.4168
1755	21.8952
1754	34.3879
1753	20.0696
1752	19.7396
1751	4.0415
1750	10.9628
1749	30.3962
1748	28.1379
1747	29.9079
1746	10.8407
1745	12.0736
1744	28.7239
1743	46.6191
1742	78.9919

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp

Fisher, D.A., 2002 - S. Greenland

sgreenpc

Fisher, D.A., 2004 - S. Greenland

del1dye2	
1756	-25.31
1755	-28.72
1754	-28.38
1753	-26.67
1752	-27.23
1751	-25.65
1750	-24.9
1749	-25.69
1748	-26.03
1747	-28.27
1746	-26.93
1745	-24.96
1744	-26.56
1743	-26.81
1742	-27.53

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)
1782	0.32	-31.8
1781	0.32	-30.2
1780	0.4	-27.2
1779	0.32	-35.8
1778	0.32	-33.2
1777	0.49	-31.5
1776	0.49	-32.5
1775	0.25	-28.8
1774	0.34	-32.1
1773	0.39	-30.9
1772	0.24	-31.8
1771	0.31	-31.7
1770	0.35	-32.4
1769	0.49	-35.9
1768	0.3	-33.1
1767	0.26	-29.8
1766	0.27	-28.1
1765	0.27	-28.8
1764	0.37	-32.2
1763	0.27	-30
1762	0.27	-30.5
1761	0.18	-32.6
1760	0.29	-32.1
1759	0.19	-32.1
1758	0.26	-30.7
1757	0.21	-30.7
1756	0.23	-32.1
1755	0.34	-31.2
1754	0.28	-32.2
1753	0.22	-34.2
1752	0.24	-33.5
1751	0.2	-32.3
1750	0.4	-28.6

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1766	-18.665	1.6125
1765	-19.145	1.104
1764	-18.285	1.154
1763	-17.97	1.311
1762	-19.4	1.295
1761	-18.745	1.226
1760	-18.205	1.0565
1759	-19.9	1.5275
1758	-22.75	1.016
1757	-20.21	1.214
1756	-18.8	1.0995
1755	-18.765	1.613
1754	-19.79	1.018
1753	-18.87	1.4795
1752	-18.68	1.1395
1751	-17.625	1.597
1750	-18.565	1.2375
1749	-17.3	1.019
1748	-14.86	1.418
1747	-19.11	1.4735
1746	-20.4	1.269
1745	-18.655	1.3885
1744	-20.425	1.2435
1743	-20.635	1.3385
1742	-19.535	1.5105
1741	-16.545	1.222
1740	-17.165	1.318
1739	-17.93	1.63
1738	-16.625	1.327
1737	-18.64	1.178
1736	-19.165	1.223
1735	-18.57	1.6655
1734	-21.16	1.6465

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1778
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-287.5						1769	0.24503			1752	0.247
-287						1768	0.2817			1751	0.21
-283.5						1767	0.20926			1750	-0.475
-274.1						1766	0.17304			1749	0.442
-277						1765	0.16399			1748	0.656
-281.9						1764	0.21898			1747	0.245
-296.7						1763	0.30148			1746	-0.769
-302.2						1762	0.24704			1745	0.723
-297.2						1761	0.24727			1744	0.309
-291.7						1760	0.16499			1743	-0.668
-290.3						1759	0.23865			1742	0.839
-287.6						1758	0.40465			1741	0.916
-283.3						1757	0.16566			1740	1.245
-284						1756	0.27644			1739	0.49
-289.6						1755	0.21217			1738	-2.227
-296.8						1754	0.31412			1737	-2.613
-289						1753	0.24056			1736	0.133
-280.9						1752	0.17595			1735	-2.363
-288.2						1751	0.26884			1734	-0.67
-301.1						1750	0.28774			1733	0.085
-303.8						1749	0.38131			1732	2.102
-295						1748	0.22346			1731	1.791
-284.8						1747	0.34498			1730	1.846
-284.6						1746	0.1773			1729	0.943
-285.1						1745	0.16813			1728	0.851
-294.2						1744	0.25243			1727	1.323
-313.5						1743	0.20592			1726	0.163
-307.2						1742	0.28116			1725	-0.257
-298.1						1741	0.18759			1724	-0.652
-287.4						1740	0.23477			1723	-2.141
-280.2						1739	0.15976			1722	-1.452
-275.3						1738	0.28229			1721	-1.193
-271.1						1737	0.21656			1720	-1.089

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1720	4.472	706	-0.332	1423.348	16.301	.				1722	2901			1731	0.95		
1719	4.787	701	0.307	1420.046	41.299	.				1721	2910			1730	1.245		
1718	3.477	696	-0.314	1416.733	79.001	.				1720	2917			1729	1.767		
1717	2.898	691	-0.142	1413.407	39.2	.				1719	2948			1728	1.321		
1716	1.279	686	-0.588	1410.069	84	.				1718	2913			1727	1.391		
1715	0.759	681	-0.214	1406.72	55	.				1717	2798			1726	0.304		
1714	0.543	676	-0.391	1403.358	50.5	.				1716	2762			1725	0.838		
1713	0.636	671	-0.647	1399.984	34.8	.				1715	2750			1724	-0.208		
1712	0.409	666	-0.172	1396.597	13.3	.				1714	2735			1723	0.439		
1711	0.104	661	0.653	1393.198	19.3	.				1713	2783			1722	-1.358		
1710	-0.791	656	1.342	1389.787	53.5	.				1712	2830			1721	-0.762		
1709	-1.456	651	0.654	1386.363	50.6	.				1711	2882			1720	-0.418		
1708	-0.949	646	-0.283	1382.927	64	.				1710	2885			1719	-0.589		
1707	-0.54	641	1.881	1379.478	35.8	.				1709	2912			1718	-0.163		
1706	2.305	636	-0.059	1376.016	80	.				1708	2919			1717	-0.3		
1705	3.284	631	-0.332	1372.542	76.998	.				1707	2869			1716	0.317		
1704	3.904	626	-0.52	1369.055	33.002	.				1706	2828			1715	0.009		
1703	4.435	621	-0.091	1365.555	66	.				1705	2850			1714	0.185		
1702	4.296			1362.043	41.5	.				1704	2808			1713	0.651		
1701	4.114			1358.517	58.5	.				1703	2755			1712	0.4		
1700	3.823			1354.978	58.8	.				1702	2815			1711	0.189		
1699	3.946			1351.427	81	.				1701	2933			1710	0.006		
1698	4.39			1347.862	49	.				1700	2940			1709	0.806		
1697	4.426			1344.284	26.599	.				1699	2891			1708	0.118		
1696	3.834			1340.692	35.999	.				1698	2887			1707	-0.696		
1695	2.887			1337.088	51.002	.				1697	2874			1706	-0.83		
1694	1.966			1333.47	31.5	.				1696	2830			1705	-0.456		
1693	1.062			1329.838	96	.				1695	2841			1704	0.268		
1692	-0.138			1326.193	72.5	.				1694	2889			1703	-0.055		
1691	-0.69			1322.535	80	.				1693	2896			1702	0.02		
1690	-0.54			1318.862	51	.				1692	2930			1701	-0.042		
1689	0.037			1315.176	64.5	.				1691	2813			1700	-0.375		
1688	0.309			1311.477	97.5	.				1690	2773			1699	-1.046		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2

1741	76.8313
1740	1.2461
1739	9.1318
1738	46.3628
1737	27.6863
1736	46.0229
1735	81.5772
1734	72.7542
1733	10.975
1732	6.3242
1731	51.0381
1730	12.684
1729	5.0913
1728	53.8945
1727	34.0339
1726	24.72
1725	37.1588
1724	27.8328
1723	81.8117
1722	52.5395
1721	11.1947
1720	3.4433
1719	14.2709
1718	28.1623
1717	26.8806
1716	16.0165
1715	13.16
1714	49.8052
1713	26.7035
1712	50.0102
1711	64.7439
1710	46.668
1709	30.445

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp

Fisher, D.A., 2002 - S. Greenland

sgreenpc

Fisher, D.A., 2004 - S. Greenland

del1dye2

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)
1749	0.3	-27.5
1748	0.31	-24.6
1747	0.41	-28.9
1746	0.21	-29.9
1745	0.21	-30.3
1744	0.3	-34
1743	0.33	-33.3
1742	0.21	-28.8
1741	0.38	-28.4
1740	0.28	-31.8
1739	0.42	-31.9
1738	0.44	-32.4
1737	0.34	-32.3
1736	0.57	-28.2

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1733	-19.43	1.259
1732	-22.9	1.6405
1731	-19.935	1.528
1730	-19.515	0.8415
1729	-16.32	1.421
1728	-17.35	1.2585
1727	-19.145	1.3185
1726	-20.07	1.379
1725	-21.565	1.4615
1724	-14.96	1.069
1723	-15.36	1.2565
1722	-16.085	1.2665
1721	-18.865	1.4455
1720	-17.315	1.3805
1719	-18.28	1.0725
1718	-19.375	1.7495
1717	-19.935	1.225
1716	-20.615	1.441
1715	-19.87	1.6295
1714	-18.755	1.3625
1713	-16.2	1.27
1712	-17.21	1.4085
1711	-17.035	1.6115
1710	-17.21	1.166
1709	-15.995	1.3905
1708	-20.64	1.3655
1707	-18.105	1.4885
1706	-19.82	1.5
1705	-19.58	1.5335
1704	-19.67	1.3855
1703	-19.815	1.442
1702	-18.9	1.7235
1701	-19.745	1.1435

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
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Fisher, D.A.., 2002 - Siple Dome, Antarctica

delta D mean annual	siple210.ant	O-18
-276.4		
-284.7		
-278.4		
-271.1		
-271.5		
-293.6		
-297		
-277.9		
-273.6		
-290.4		
-319.6		
-328		
-310.8		
-309.1		
-310.1		
-304		
-296.7		
-284.2		
-300.2		
-281.9		
-272		
-291.1		
-292.9		
-296.6		
-294.1		
-290.6		
-298.4		
-293.9		
-283.9		
-279.9		
-279.6		
-284.1		
-283.4		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1736	0.20739
1735	0.34927
1734	0.25514
1733	0.24597
1732	0.2368
1731	0.28445
1730	0.29429
1729	0.29464
1728	0.22833
1727	0.31443
1726	0.18115
1725	0.24814
1724	0.18149
1723	0.34432
1722	0.2968
1721	0.23955
1720	0.2494
1719	0.27849
1718	0.18253
1717	0.24037
1716	0.31767
1715	0.15414
1714	0.18312
1713	0.16399
1712	0.38628
1711	0.261
1710	0.20316
1709	0.27108
1708	0.26159
1707	0.17454
1706	0.22312
1705	0.12621
1704	0.30113

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1719	-0.329
1718	-0.3
1717	1.028
1716	1.527
1715	0.547
1714	0.029
1713	0.423
1712	0.393
1711	-0.056
1710	1.145
1709	1.091
1708	-0.336
1707	0.028
1706	-1.104
1705	-1.657
1704	-0.995
1703	-1.609
1702	-0.27
1701	-1.406
1700	-2.417
1699	-2.332
1698	0.403
1697	0.394
1696	-0.643
1695	1.183
1694	-0.088
1693	1.026
1692	1.718
1691	0.003
1690	0.56
1689	-1.198
1688	-1.436
1687	0.795

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1687	0.244			1307.763	50.2	.				1689	2829			1698	-1.246		
1686	0.7			1304.036	54.5	.				1688	2885			1697	-1.081		
1685	1.226			1300.294	69.799	.				1687	2875			1696	-1.343		
1684	2.518			1296.539	89.501	.				1686	2831			1695	-0.303		
1683	3.144			1292.769	72.999	.				1685	2837			1694	-0.762		
1682	3.413			1288.986	70.501	.				1684	2903			1693	0.192		
1681	1.768			1285.187	74.699	.				1683	2905			1692	0.726		
1680	2.128			1281.375	66.201	.				1682	2863			1691	-0.052		
1679	2.829			1277.549	80	.				1681	2783			1690	0.503		
1678	2.998			1273.708	64.498	.				1680	2735			1689	-0.612		
1677	2.407			1269.852	41.501	.				1679	2666			1688	-1.069		
1676	1.599			1265.982	75.2	.				1678	2622			1687	0.626		
1675	1.541			1262.097	32.501	.				1677	2707			1686	0.039		
1674	0.48			1258.198	61.599	.				1676	2761			1685	-0.375		
1673	-0.607			1254.283	57	.				1675	2776			1684	0.866		
1672	-0.556			1250.354	70.499	.				1674	2808			1683	0.849		
1671	1			1246.41	31	.				1673	2728			1682	-1.485		
1670	-0.104			1242.451	69.002	.				1672	2686			1681	0.192		
1669	-0.416			1238.477	92.5	.				1671	2776			1680	-1.905		
1668	-0.294			1234.488	99	.				1670	2911			1679	0.182		
1667	0.164			1230.483	100	.				1669	2898			1678	-0.213		
1666	0.649			1226.464	96	.				1668	2651			1677	-0.588		
1665	1.318			1222.429	83.3	.				1667	2849			1676	-1.165		
1664	1.943			1218.378	68.5	.				1666	2932			1675	0.412		
1663	2.58			1214.312	60.3	.				1665	2946			1674	1.266		
1662	2.224			1210.231	80.3	.				1664	2888			1673	0.347		
1661	1.087			1206.133	91	.				1663	2809			1672	-0.646		
1660	1.295			1202.02	63	.				1662	2739			1671	-0.689		
1659	1.026			1197.892	58.999	.				1661	2679			1670	0.09		
1658	-0.87			1193.747	67.501	.				1660	2656			1669	0.188		
1657	-0.319			1189.586	65	.				1659	2763			1668	-0.129		
1656	0.037			1185.41	92	.				1658	2809			1667	1.132		
1655	-0.171			1181.217	90	.				1657	2845			1666	0.843		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island

pc1yr2	
1708	26.0347
1707	4.4321
1706	22.6326
1705	31.9587
1704	70.4593
1703	0.001
1702	40.0885
1701	59.9356
1700	11.683
1699	14.1122
1698	25.5501
1697	12.4215
1696	15.8456
1695	23.7142

Fisher et al., 1998 - Penny Ice Cap, Baffin Island

pc25yrsp

Fisher, D.A., 2002 - S. Greenland

sgreenpc

Fisher, D.A., 2004 - S. Greenland

del1dye2

Holdsworth et al., 1992 & 1993 - Mt Logan Canada

Year	Accum (m)	Delta 18O (per mil)

Thompson et al., 1992 - Quelccaya, Peru

Thermal Year	O18	Accumulation (m)
1700	-18.485	2.2415
1699	-19.49	1.5365
1698	-21.77	1.1865
1697	-19.275	1.321
1696	-18.595	1.5865
1695	-18.095	1.5265
1694	-16.385	1.0745
1693	-17.975	1.47
1692	-19.725	1.7735
1691	-16.515	1.516
1690	-20.755	1.521
1689	-20.825	1.491
1688	-17.435	1.564
1687	-16.51	2.0365
1686	-19.745	1.34
1685	-19.48	1.2435
1684	-18.31	1.4165
1683	-19.03	1.7605
1682	-17.01	1.3585
1681	-18.79	1.159
1680	-20.37	2.0165
1679	-20.195	2.2605
1678	-19.835	1.619
1677	-17.715	1.621
1676	-19.85	1.8
1675	-18.55	1.841
1674	-19.465	1.532
1673	-20.285	1.677
1672	-19.235	1.8945
1671	-17.195	1.8315
1670	-19.135	1.4885
1669	-18.875	1.7675
1668	-18.675	1.3895

Thompson et al., 2003:Quelccaya, Peru

End year of 10 yr period	O-18

Thompson et al., 2003: Dunde, China

End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18
-270.5		
-274.2		
-282.2		
-283.4		
-290.4		
-289.5		
-278.5		
-272.2		
-272.8		
-282.7		
-292.6		
-308.3		
-299.5		
-291.8		
-293.2		
-291.1		
-284.5		
-292.2		
-318		
-303.5		
-274.3		
-267.8		
-277.5		
-292.1		
-300.8		
-306		
-301		
-283.9		
-281		
-281.5		
-273.8		
-263.4		
-255		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		
Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS	
Year	Model ice Equiv
1703	0.33068
1702	0.17514
1701	0.15578
1700	0.21432
1699	0.33152
1698	0.30245
1697	0.26362
1696	0.35185
1695	0.31302
1694	0.19571
1693	0.21542
1692	0.28418
1691	0.22552
1690	0.33361
1689	0.23563
1688	0.30454
1687	0.24575
1686	0.26549
1685	0.18686
1684	0.31504
1683	0.31518
1682	0.19709
1681	0.29573
1680	0.25641
1679	0.27627
1678	0.28637
1677	0.32598
1676	0.29652
1675	0.17793
1674	0.26707
1673	0.29682
1672	0.22765
1671	0.18818

NGRIP 2004 - 50 year means - N. Greenland	
Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
Year	PC1 series
1686	-0.07
1685	-0.227
1684	1.399
1683	-0.968
1682	-0.273
1681	-0.175
1680	-0.667
1679	0.702
1678	-0.086
1677	-0.636
1676	-0.288
1675	0.091
1674	-0.094
1673	0.05
1672	-1.185
1671	-2.025
1670	1.441
1669	0.035
1668	-0.326
1667	0.803
1666	1.314
1665	1.069
1664	0.777
1663	1.25
1662	-1.547
1661	-0.469
1660	1.15
1659	-1.385
1658	0.723
1657	1.658
1656	-1.463
1655	0.681
1654	-0.385

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1654	-0.492			1177.008	77	.				1656	2866			1665	-0.014		
1653	-0.08			1172.783	81	.				1655	2881			1664	1.314		
1652	-0.332			1168.542	68	.				1654	2860			1663	1.01		
1651	0.623			1164.284	73	.				1653	2693			1662	-0.635		
1650	2.558			1160.01	63.499	.				1652	2913			1661	-0.645		
1649	2.823			1155.719	36.501	.				1651	2917			1660	0.494		
1648	3.12			1151.411	87.2	.				1650	2871			1659	-0.459		
1647	3.207			1147.087	77	.				1649	2828			1658	-0.163		
1646	2.938			1142.746	68	.				1648	2789			1657	0.995		
1645	3.199			1138.388	85	.				1647	2767			1656	0.359		
1644	4.809			1134.014	82	.				1646	2824			1655	-0.548		
1643	6.556			1129.622	100	.				1645	2971			1654	-0.379		
1642	3.789			1125.213	94	.				1644	2912			1653	-0.223		
1641	2.722			1120.787	62.5	.				1643	2919			1652	0.272		
1640	2.719			1116.344	73	.				1642	2948			1651	1.122		
1639	-0.477			1111.883	47.501	.				1641	2950			1650	-0.075		
1638	-1.759			1107.405	41.499	.				1640	2891			1649	1.049		
1637	-2.104			1102.91	82	.				1639	2787			1648	-0.696		
1636	-2.5			1098.397	62	.				1638	2722			1647	-0.693		
1635	-2.564			1093.866	58.5	.				1637	2676			1646	0.059		
1634	-2.394			1089.318	79.8	.				1636	2616			1645	-0.324		
1633	-0.988			1084.752	100	.				1635	2616			1644	-0.848		
1632	-0.238			1080.167	89.5	.				1634	2695			1643	-0.458		
1631	0.166			1075.565	69.501	.				1633	2808			1642	0.004		
1630	0.141			1070.945	76.699	.				1632	2830			1641	-0.813		
1629	0.083			1066.307	34.199	.				1631	2816			1640	-0.313		
1628	-0.441			1061.65	36.499	.				1630	2893			1639	-0.504		
1627	-0.782			1056.975	98.002	.				1629	2901			1638	0.149		
1626	-0.291			1052.282	89	.				1628	2818			1637	-0.045		
1625	0.51			1047.57	89	.				1627	2697			1636	-0.817		
1624	0.723			1042.839	93.3	.				1626	2735			1635	0.229		
1623	-0.186			1038.09	98	.				1625	2697			1634	-0.848		
1622	-0.746			1033.323	85.5	.				1624	2718			1633	-0.275		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1667	-19.48	2.1005				
								1666	-18.36	1.7145				
								1665	-22.48	1.4345				
								1664	-20.085	2.192				
								1663	-20.555	1.6225				
								1662	-15.81	1.4915				
								1661	-18.575	2.395				
								1660	-20.28	2.0025				
								1659	-17.55	1.756				
								1658	-17.115	1.6805				
								1657	-14.475	1.6905				
								1656	-17.37	1.589				
								1655	-18.35	1.7005				
								1654	-19.68	1.5575				
								1653	-18.13	1.7825				
								1652	-16.705	1.612				
								1651	-19.84	2.086				
								1650	-17.99	1.7595				
								1649	-18.325	1.9905				
								1648	-15.995	1.434				
								1647	-16.855	1.959				
								1646	-18.23	1.635				
								1645	-17.145	1.639				
								1644	-20.585	2.1365				
								1643	-18.71	1.795				
								1642	-22.4	1.768				
								1641	-19.145	1.8865				
								1640	-17.29	1.974				
								1639	-19.775	2.2325				
								1638	-19.585	1.6735				
								1637	-17.655	1.7935				
								1636	-13.41	1.808				
								1635	-15.925	1.6695				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-269.2						1670	0.26749			1653	-1.432
-291.6						1669	0.22792			1652	0.562
-298.8						1668	0.27752			1651	0.048
-302.1						1667	0.37684			1650	1.325
-302.2						1666	0.22821			1649	1.936
-293.2						1665	0.14889			1648	0.219
-292.5						1664	0.1985			1647	1.317
-263.7						1663	0.18864			1646	-0.179
-241.3						1662	0.22838			1645	-1.908
-250.2						1661	0.25826			1644	-0.169
-270.1						1660	0.19868			1643	-0.756
-273						1659	0.22855			1642	-1.964
-278.4						1658	0.26842			1641	0.423
-286						1657	0.34806			1640	0.271
-291.5						1656	0.26859			1639	0.838
-277.5						1655	0.23885			1638	-0.712
-254.6						1654	0.26875			1637	-1.049
-259.8						1653	0.26878			1636	-1.377
-269.5						1652	0.20915			1635	0.051
-270.9						1651	0.24905			1634	-0.954
-268.8						1650	0.25907			1633	-1.108
-271.9						1649	0.21921			1632	-1.711
-281.3						1648	0.25912			1631	0.161
-292.2						1647	0.25925			1630	-0.538
-289.3						1646	0.29918			1629	-0.607
-278.3						1645	0.30922			1628	0.409
-277.2						1644	0.15962			1627	-1.286
-278.8						1643	0.31939			1626	-0.011
-282.7						1642	0.2496			1625	-0.82
-289.3						1641	0.17968			1624	1.542
-293.6						1640	0.22963			1623	-0.007
-297.7						1639	0.23966			1622	-0.703
-306.8						1638	0.29964			1621	1.504

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1621	-1.931			1028.536	67.8	.				1623	2698			1632	-0.241		
1620	-1.645			1023.73	70.5	.				1622	2680			1631	-0.073		
1619	-1.143			1018.906	87	.				1621	2715			1630	0.392		
1618	-1.726			1014.062	67.298	.				1620	2847			1629	0.623		
1617	-1.645			1009.2	56.502	.				1619	2869			1628	1.115		
1616	-1.016			1004.317	90.499	.				1618	2898			1627	-0.47		
1615	-0.574			999.416	62.599	.				1617	2897			1626	-0.239		
1614	0.11			994.495	70.502	.				1616	2881			1625	-1.285		
1613	-0.612			989.555	85.498	.				1615	2857			1624	-1.039		
1612	-1.634			984.59	61.302	.				1614	2788			1623	0.015		
1611	-2.341			979.616	69	.				1613	2777			1622	0.079		
1610	-0.837			974.616	93.5	.				1612	2740			1621	-0.085		
1609	-0.172			969.597	91.7	.				1611	2773			1620	0.696		
1608	0.954			964.558	85	.				1610	2826			1619	0.706		
1607	0.733			959.499	45.6	.				1609	2848			1618	0.175		
1606	0.293			954.419	96	.				1608	2917			1617	0.45		
1605	0.053			949.32	58.5	.				1607	2955			1616	0.214		
1604	0.379			944.199	94	.				1606	2876			1615	1.205		
1603	0.604			939.059	86.5	.				1605	2785			1614	0.823		
1602	2.114			933.898	100	.				1604	2720			1613	0.123		
1601	1.771			928.717	90	.				1603	2697			1612	0.073		
1600	0.837			923.51	81.3	.				1602	2786			1611	0.46		
1599	0.822			918.29	100	.				1601	2869			1610	0.308		
1598	1.093			913.048	77	.				1600	2856			1609	0.74		
1597	1.09			907.78	78	.				1599	2805			1608	0.371		
1596	0.634			902.498	59.1	.				1598	2761			1607	-0.376		
1595	0.294			897.19	67.6	.				1597	2772			1606	0.675		
1594	-0.185			891.86	74.5	.				1596	2758			1605	-0.41		
1593	0.261			886.51	55.498	.				1595	2741			1604	-0.422		
1592	-0.114			881.14	85.002	.				1594	2740			1603	0.885		
1591	-0.401			875.75	85	.				1593	2754			1602	-1.049		
1590	0.141			870.337	65.999	.				1592	2771			1601	-0.221		
1589	0.947			864.9	76.501	.				1591	2830			1600	0.54		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1634	-18.03	1.851				
								1633	-17.645	1.456				
								1632	-19.085	1.903				
								1631	-20.31	2.344				
								1630	-18.885	2.1705				
								1629	-21.335	1.92				
								1628	-19.47	1.6475				
								1627	-19.945	2.07				
								1626	-19.62	1.753				
								1625	-17.525	2.028				
								1624	-17.345	1.6985				
								1623	-19.85	1.822				
								1622	-18.79	1.7455				
								1621	-17.245	1.832				
								1620	-17.335	1.9895				
								1619	-16.91	1.481				
								1618	-18.315	1.308				
								1617	-18.695	1.1905				
								1616	-18.705	1.0275				
								1615	-18.37	1.5875				
								1614	-18.87	1.919				
								1613	-18.29	1.5635				
								1612	-18.725	1.563				
								1611	-19.79	1.332				
								1610	-17.875	1.473				
								1609	-17.155	1.646				
								1608	-16.83	1.651				
								1607	-16.94	1.779				
								1606	-18.265	1.474				
								1605	-18.835	1.527				
								1604	-19.02	1.9965				
								1603	-20.13	1.837				
								1602	-20.68	1.3645				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1646
																					1645
																					1644
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Fisher, D.A.., 2002 - Siple Dome, Antarctica

delta D mean annual	siple210.ant	O-18
-307.6		
-300		
-294		
-294.3		
-293.2		
-286.8		
-289.8		
-291.7		
-295.5		
-286.2		
-279.6		
-290.3		
-310		
-312		
-300.9		
-291.6		
-290.1		
-299.7		
-322.4		
-318.2		
-295.9		
-284.3		
-285.9		
-285.6		
-284.1		
-293.2		
-301.6		
-302.7		
-304.5		
-299		
-290		
-287.1		
-286.2		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1637	0.20978
1636	0.3798
1635	0.32989
1634	0.22999
1633	0.25005
1632	0.21001
1631	0.27013
1630	0.34019
1629	0.30026
1628	0.26021
1627	0.22025
1626	0.2303
1625	0.17028
1624	0.18032
1623	0.36068
1622	0.24051
1621	0.23051
1620	0.28068
1619	0.26075
1618	0.30091
1617	0.24085
1616	0.29104
1615	0.23087
1614	0.28117
1613	0.31142
1612	0.24119
1611	0.2111
1610	0.25138
1609	0.23133
1608	0.18104
1607	0.1912
1606	0.25168
1605	0.15095

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1620	0.89
1619	0.298
1618	0.661
1617	-0.174
1616	0.01
1615	1.344
1614	-0.087
1613	0.259
1612	0.592
1611	-0.042
1610	0.016
1609	-0.401
1608	1.292
1607	-1.289
1606	0.762
1605	-1.427
1604	0.272
1603	-0.297
1602	-0.738
1601	0.95
1600	-0.102
1599	0.439
1598	-1.426
1597	0.927
1596	0.242
1595	0.592
1594	0.64
1593	-0.473
1592	-0.698
1591	0.116
1590	0.013
1589	-0.605
1588	-0.104

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Fisher & Koerner 1995 - Agassiz Ice Cap

MGNORM.1yr	% MELT-NORMALIZED DEPARTURES
1588	2.011
1587	2.817
1586	2.995
1585	1.741
1584	0.578
1583	-0.879
1582	-2.462
1581	-2.818
1580	-2.688
1579	-2.823
1578	-1.564
1577	-1.039
1576	-0.159
1575	-0.734
1574	-0.993
1573	-1.346
1572	-1.114
1571	-0.478
1570	-0.627
1569	-1.024
1568	-0.734
1567	-0.241
1566	-1.099
1565	-1.068
1564	-0.972
1563	-1.111
1562	-2.013
1561	1.024
1560	1.068
1559	0.548
1558	0.438
1557	0.249
1556	0.314

Fisher & Koerner 1994 - Agassiz Ice Cap

pcnorm-5.all	% MELT-NORMALIZED DEPARTURES

Tarrussov 1992

YEAR	% melt: H(	% melt: H(	mean % M
859.44	87.5	.	
853.96	78.4	.	
848.46	66.7	.	
842.94	55.4	.	
837.39	58.4	.	
831.828	66.9	.	
826.238	57.7	.	
820.626	68	.	
814.99	74.499	.	
809.33	96.001	.	
803.65	82.2	.	
797.95	100	.	
792.22	34.5	.	
786.476	61	.	
780.7	86	.	
774.91	73.7	.	
769.09	83.2	.	
763.25	87	.	
757.38	86.5	.	
751.496	100	.	
745.58	100	.	
739.648	100	.	
733.689	86.5	.	
727.7	100	.	
721.698	100	.	
715.667	100	.	
709.61	100	.	
703.53	70.2	.	
697.426	64.8	.	
691.296	61.498	.	
685.14	53.002	.	
678.96	62.2	.	
672.76	100	.	

Fisher, D.A., 2003 - N. Greenland

delnort3.stk	O-18

Fisher, D.A., 2002 - Devon Ice Cap

bld-1.dev	
1590	2799
1589	2794
1588	2808
1587	2827
1586	2805
1585	2791
1584	2747
1583	2713
1582	2705
1581	2679
1580	2685
1579	2670
1578	2680
1577	2728
1576	2793
1575	2809
1574	2843
1573	2878
1572	2904
1571	2908
1570	2854
1569	2823
1568	2767
1567	2676
1566	2689
1565	2849
1564	2918
1563	2950
1562	2975
1561	2952
1560	2872
1559	2831
1558	2827

Fisher, D. A., 2003 - Devon Ice Cap

pc5bld.dev	% melt

Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)

delnorm6.cwg	O-18
1599	-0.722
1598	-0.79
1597	0.125
1596	-0.06
1595	0.23
1594	0.472
1593	-0.247
1592	-1.025
1591	0.239
1590	-0.128
1589	0.332
1588	0.143
1587	1.126
1586	0.573
1585	0.431
1584	-1.144
1583	-0.298
1582	0.011
1581	0.427
1580	-0.203
1579	0.019
1578	0.273
1577	0.471
1576	-0.742
1575	0.411
1574	0.928
1573	1.119
1572	0.784
1571	-0.018
1570	0.873
1569	0.751
1568	-0.793
1567	-1.15

Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island

Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1601	-20.87	1.407				
								1600	-18.78	1.813				
								1599	-18.67	1.9755				
								1598	-17.915	1.4735				
								1597	-17.69	1.6525				
								1596	-16.805	1.4335				
								1595	-16.53	1.582				
								1594	-16.94	1.9215				
								1593	-17.34	1.285				
								1592	-17.66	1.4975				
								1591	-18.155	1.4035				
								1590	-18.355	1.505				
								1589	-18.69	2.0935				
								1588	-19.74	1.724				
								1587	-18.87	2.1855				
								1586	-19.78	1.39				
								1585	-16.87	1.4255				
								1584	-15.745	1.5105				
								1583	-17.685	1.6745				
								1582	-18.025	1.919				
								1581	-18.895	1.9055				
								1580	-18.025	1.747				
								1579	-19.485	1.6395				
								1578	-21.075	1.686				
								1577	-19.125	2.0275				
								1576	-19.36	1.8285				
								1575	-18.72	1.699				
								1574	-17.165	1.3315				
								1573	-20.1	1.842				
								1572	-21.285	1.1				
								1571	-16	1.342				
								1570	-19.27	1.377				
								1569	-20.425	1.631				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1613
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Fisher, D.A.., 2002 - Siple Dome, Antarctica

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Meese et al., 1994 (revised): GIS

NGRIP 2004 - 50 year means - N. Greenland

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

delta D mean annual	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
-279.9						1604	0.30215			1587	1.377
-283.9						1603	0.27195			1586	1.116
-275.2						1602	0.33257			1585	-1.074
-264.3						1601	0.20157			1584	-0.735
-275.6						1600	0.20169			1583	1.07
-281.4						1599	0.25216			1582	1.876
-285.1						1598	0.25219			1581	-0.079
-286.7						1597	0.30279			1580	0.568
-292.2						1596	0.20188			1579	0.693
-291.3						1595	0.26253			1578	-0.009
-280.7						1594	0.21207			1577	-1.18
-276.8						1593	0.22225			1576	-0.64
-283.5						1592	0.11113			1575	-0.177
-292.6						1591	0.30316			1574	-0.286
-290.3						1590	0.23247			1573	1.073
-287.9						1589	0.29327			1572	-0.296
-292.4						1588	0.38449			1571	-0.74
-298.3						1587	0.28339			1570	0.652
-304.4						1586	0.23279			1569	1.455
-294.4						1585	0.23292			1568	0.425
-288.6						1584	0.28358			1567	1.543
-286.7						1583	0.18232			1566	0.296
-299.1						1582	0.32433			1565	-0.373
-284.5						1581	0.22305			1564	-1.092
-278.4						1580	0.2129			1563	0.313
-276.8						1579	0.22309			1562	0.115
-279.1						1578	0.33474			1561	-0.95
-289						1577	0.33489			1560	-0.837
-283						1576	0.14206			1559	-0.57
-278.3						1575	0.24365			1558	-1.38
-290.5						1574	0.29457			1557	0.039
-295.9						1573	0.25399			1556	1.08
-293.5						1572	0.18284			1555	0.519

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MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1555	0.236			666.53	80.3	.				1557	2873			1566	-0.565		
1554	0.855			660.28	97	.				1556	2811			1565	-0.4		
1553	0.284			654	100	.				1555	2768			1564	-0.169		
1552	1.163			647.7	100	.				1554	2717			1563	0.261		
1551	1.756			641.37	100	.				1553	2676			1562	0.153		
1550	2.122			635.02	100	.				1552	2771			1561	-1.197		
1549	0.802			628.64	100	.				1551	2654			1560	-1.013		
1548	-0.399			622.238	100	.				1550	2636			1559	0.134		
1547	0.208			615.809	100	.				1549	2671			1558	0.352		
1546	-0.515			609.35	100	.				1548	2749			1557	0.704		
1545	0.307			602.87	100	.				1547	2971			1556	0.84		
1544	2.845			596.36	100	.				1546	2919			1555	-0.246		
1543	3.345			589.83	100	.				1545	2833			1554	0.366		
1542	1.753			583.27	100	.				1544	2757			1553	0.565		
1541	0.726			576.689	100	.				1543	2848			1552	0.293		
1540	-1.333			570.078	100	.				1542	2788			1551	0.362		
1539	-0.738			563.44	100	.				1541	2716			1550	0.859		
1538	-0.174			556.778	100	.				1540	2678			1549	1.181		
1537	0.03			550.087	98.5	.				1539	2716			1548	0.1		
1536	-0.056			543.37	100	.				1538	2620			1547	-0.506		
1535	0.854			536.628	93	.				1537	2674			1546	-0.585		
1534	0.922			529.858	90	.				1536	2684			1545	-0.855		
1533	2.318			523.06	100	.				1535	2655			1544	-0.009		
1532	2.937			516.238	99.5	.				1534	2743			1543	-0.384		
1531	3.305			509.387	83.3	.				1533	2786			1542	-0.723		
1530	2.892			502.51	87.5	.				1532	2810			1541	0.836		
1529	1.873			495.6	100	.				1531	2826			1540	-0.806		
1528	0.418			488.67	100	.				1530	2851			1539	-0.94		
1527	-0.256			481.71	100	.				1529	2746			1538	0.405		
1526	-0.171			474.728	100	.				1528	2752			1537	0.424		
1525	0.968			467.71	100	.				1527	2789			1536	0.658		
1524	1.6			460.67	100	.				1526	2842			1535	-0.382		
1523	2.588			453.6	100	.				1525	3018			1534	0.76		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1568	-19.335	1.4465				
								1567	-19.065	1.1665				
								1566	-13.04	1.475				
								1565	-17.57	1.511				
								1564	-17.01	1.504				
								1563	-18.085	1.72				
								1562	-19.89	1.8195				
								1561	-18.29	1.515				
								1560	-20.105	1.7335				
								1559	-17.93	1.6085				
								1558	-19.48	1.463				
								1557	-17.52	1.5845				
								1556	-18.375	1.394				
								1555	-17.695	1.2885				
								1554	-17.85	1.565				
								1553	-20.4	1.2185				
								1552	-18.495	1.613				
								1551	-17.03	1.4985				
								1550	-17.94	1.6595				
								1549	-18.77	1.7045				
								1548	-19.9	1.367				
								1547	-18.725	1.7925				
								1546	-17.495	1.4215				
								1545	-18.57	1.986				
								1544	-19.085	1.6135				
								1543	-18.28	1.811				
								1542	-18.6	1.4115				
								1541	-19.19	1.391				
								1540	-18.275	1.2735				
								1539	-16.59	1.3735				
								1538	-17.92	1.459				
								1537	-17.26	1.814				
								1536	-17.845	1.638				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1580
																					1579
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delta D mean annual	siple210.ant	O-18
-290.5		
-286.3		
-290.5		
-298.5		
-300.5		
-303.9		
-262.7		
-262.3		
-270		
-284.1		
-282.5		
-267.9		
-257.7		
-269.2		
-273.1		
-274		
-276.4		
-280.7		
-281.2		
-284.8		
-293.3		
-291.9		
-290.1		
-292.3		
-287.3		
-299.3		
-299.3		
-293.4		
-286.7		
-283.7		
-292.5		
-289.3		

Fisher, D.A.., 2002 - Siple Dome, Antarctica

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1571	0.24395
1570	0.22361
1569	0.26437
1568	0.21357
1567	0.30527
1566	0.19335
1565	0.25449
1564	0.19348
1563	0.21388
1562	0.27505
1561	0.13239
1560	0.2751
1559	0.1427
1558	0.1733
1557	0.2039
1556	0.2345
1555	0.25502
1554	0.28565
1553	0.24498
1552	0.24501
1551	0.17352
1550	0.35749
1549	0.22478
1548	0.26562
1547	0.24524
1546	0.24537
1545	0.23518
1544	0.19427
1543	0.33764
1542	0.25578
1541	0.28655
1540	0.32765
1539	0.19459

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1554	-0.12
1553	1.274
1552	1.732
1551	-0.529
1550	2.109
1549	0.917
1548	-1.196
1547	-0.005
1546	0.533
1545	0.603
1544	-0.376
1543	-1.276
1542	-0.97
1541	-0.467
1540	-0.577
1539	-0.017
1538	-1.539
1537	1.501
1536	-1.819
1535	-0.764
1534	-1.139
1533	0.301
1532	-0.466
1531	0.455
1530	0.682
1529	0.037
1528	-0.578
1527	-0.117
1526	-0.829
1525	-1.184
1524	-0.217
1523	0.247
1522	1.532

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap		Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev		pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1522	3.18			446.507	100	.			1524	3032			1533	-0.033		
1521	2.548			439.38	100	.			1523	3006			1532	0.655		
1520	1.634			432.23	100	.			1522	2947			1531	0.535		
1519	0.527			425.05	100	.			1521	2854			1530	1.058		
1518	0.477			417.84	100	.			1520	2828			1529	-0.153		
1517	1.342			410.606	100	.			1519	2808			1528	-0.73		
1516	1.375			403.34	100	.			1518	2797			1527	0.508		
1515	1.549			396.049	100	.			1517	2872			1526	-0.68		
1514	-0.535			388.728	100	.			1516	2909			1525	-0.552		
1513	-1.686			381.379	100	.			1515	2903			1524	0.004		
1512	-3.305			374	100	.			1514	2868			1523	-0.003		
1511	-2.942			366.59	100	.			1513	2779			1522	-0.233		
1510	-2.907			359.16	100	.			1512	2808			1521	-0.263		
1509	-0.394			351.697	100	.							1520	0.697		
1508	0.315			344.2	100	.							1519	-0.714		
1507	1.542			336.68	100	.							1518	-0.643		
1506	0.158			329.13	100	.							1517	-0.558		
1505	-0.72			321.556	100	.							1516	-0.328		
1504	-0.029			313.949	100	.							1515	0.453		
1503	0.245			306.31	100	.							1514	1.191		
1502	0.684			298.647	100	.							1513	-0.429		
1501	0.054			290.95	100	.							1512	0.727		
1500	0.202			283.228	100	.							1511	0.208		
1499	-0.201			275.47	100	.							1510	0.991		
1498	-0.57			267.69	100	.							1509	0.578		
1497	0.438			259.88	100	.							1508	-0.442		
1496	1.016			252.04	100	.							1507	0.384		
1495	1.514			244.17	100	.							1506	-0.266		
1494	2.148			236.27	100	.							1505	-0.131		
1493	2.798			228.34	100	.							1504	0.462		
1492	3.352			220.38	100	.							1503	-0.183		
1491	2.978			212.39	100	.							1502	-0.169		
1490	3.192			204.37	89	.							1501	0.512		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1535	-18.81	1.322				
								1534	-17.515	1.7375				
								1533	-19.255	1.5675				
								1532	-18.365	1.5295				
								1531	-15.905	1.4775				
								1530	-16.705	1.6965				
								1529	-18.915	1.532				
								1528	-18.155	1.639				
								1527	-16.61	1.257				
								1526	-16.14	1.3265				
								1525	-15.805	1.3225				
								1524	-18.15	1.2075				
								1523	-16.87	1.336				
								1522	-18.33	1.392				
								1521	-15.545	1.589				
								1520	-15.83	1.306				
								1519	-18.285	1.3165				
								1518	-19.025	1.621				
								1517	-17.81	1.69				
								1516	-18.16	1.38				
								1515	-18.44	1.5185				
								1514	-19.045	1.4765				
								1513	-19	1.4585				
								1512	-18.165	1.3325				
								1511	-16.495	1.568				
								1510	-17.095	1.7565				
								1509	-17.455	1.3155				
								1508	-17.18	1.2225				
								1507	-17.695	1.708				
								1506	-17.09	1.6435				
								1505	-16.835	1.7445				
								1504	-18.605	1.145				
								1503	-18.65	1.3705				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1547
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delta D mean annual	siple210.ant	O-18
-286.5		
-291		
-291.1		
-282.9		
-269.5		
-270.4		
-279.4		
-285.8		
-285.9		
-277.3		
-277.9		
-280.9		
-276.5		
-273.4		
-274.9		
-283.4		
-289.7		
-285		
-276.5		
-279.6		
-284.5		
-289.3		
-289		
-282.2		
-276		
-269		
-275.5		
-283.8		
-284.7		
-288.1		
-292.9		
-293.5		
-293.5		

Fisher, D.A.., 2002 - Siple Dome, Antarctica

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1538	0.26632
1537	0.18441
1536	0.31767
1535	0.2152
1534	0.22555
1533	0.2871
1532	0.26669
1531	0.24617
1530	0.31808
1529	0.19499
1528	0.28736
1527	0.1848
1526	0.25673
1525	0.25676
1524	0.25678
1523	0.30828
1522	0.24661
1521	0.20559
1520	0.15423
1519	0.19539
1518	0.16449
1517	0.27773
1516	0.2366
1515	0.16464
1514	0.18523
1513	0.247
1512	0.25737
1511	0.36035
1510	0.25744
1509	0.25746
1508	0.1957
1507	0.27821
1506	0.22669

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1521	-0.974
1520	0.569
1519	-0.589
1518	-1.066
1517	0.517
1516	1.177
1515	0.407
1514	1.997
1513	-0.571
1512	-0.728
1511	-0.11
1510	1.46
1509	-0.387
1508	-0.222
1507	1.079
1506	-0.987
1505	-0.453
1504	0.167
1503	-0.478
1502	0.743
1501	2.454
1500	-1.291
1499	0.383
1498	-1.118
1497	-0.546
1496	1.582
1495	-1.686
1494	-0.117
1493	-0.101
1492	0.16
1491	0.73
1490	0.635
1489	1.927

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1489	1.382			196.326	98	.							1500	0.736		
1488	0.909			188.248	78	.							1499	-0.201		
1487	0.116			180.14	78	.							1498	1.232		
1486	-0.669			172	88.6	.							1497	-0.369		
1485	-1.712			163.83	73.9	.							1496	0.631		
1484	-1.345			155.638	88	.							1495	0.35		
1483	-0.726			147.41	98.5	.							1494	0.145		
1482	5.38			139.15	97.8	.							1493	-0.676		
1481	7.048			130.866	91.7	.							1492	-0.537		
1480	9.957			122.549	97	.							1491	0.551		
1479	10.306			114.2	97.5	.							1490	0.035		
1478	10.878			105.82	90	.							1489	1.1		
1477	8			97.417	92	.							1488	0.233		
1476	4.914			88.979	92.5	.							1487	-0.291		
1475	2.459			80.51	94	.							1486	-0.554		
1474	1.333			72.01	100	.							1485	-0.452		
1473	-2.101			63.48	100	.							1484	-0.442		
1472	-3.3			54.927	100	.							1483	-0.213		
1471	-3.642			46.338	96	.							1482	-1.188		
1470	-3.277			37.719	100	.							1481	-0.867		
1469	-2.683			29.07	100	.							1480	-0.451		
1468	-2.099			20.39	100	.							1479	0.86		
1467	-0.069			11.68	100	.							1478	0.805		
1466	1.718			2.94	100	.							1477	-0.159		
1465	3.111			-5.83	99	.							1476	-0.667		
1464	1.848			-14.63	100	.							1475	-0.789		
1463	1.4			-23.46	100	.							1474	0.024		
1462	0.84			-32.32	100	.							1473	-0.585		
1461	2.251			-41.21	100	.							1472	-0.638		
1460	0.679			-50.131	100	.							1471	-0.734		
1459	-1.587			-59.082	.	.							1470	0.221		
1458	-2.21			-68.063	.	.							1469	0.811		
1457	-3.74			-77.074	.	.							1468	0.17		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1502	-19.255	1.339				
								1501	-18.02	1.636				
								1500	-18.645	1.1215				
								1499	-17.965	1.4195				
								1498	-17.805	1.705				
								1497	-18.575	1.5185				
								1496	-18.545	1.2955				
								1495	-18.23	1.3625				
								1494	-18.145	1.2385				
								1493	-16.16	1.0415				
								1492	-17.16	1.3445				
								1491	-16.105	1.0465				
								1490	-17.505	1.15				
								1489	-16.61	0.829				
								1488	-16.485	1.1925				
								1487	-17.52	1.2605				
								1486	-16.92	1.198				
								1485	-17.25	1.5735				
								1484	-17.545	1.1675				
								1483	-17.72	1.273				
								1482	-17.975	1.54				
								1481	-18.685	1.4115				
								1480	-17.5	1.0095				
								1479	-17.23	1.0785				
								1478	-18.37	1.422				
								1477	-17.975	1.3595				
								1476	-18.675	1.0195				
								1475	-18.62	1.4045				
								1474	-18.275	1.168				
								1473	-18.785	1.277				
								1472	-18.455	1.309				
								1471	-17.74	1.1485				
								1470	-18.245	1.7225				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1514
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18
-293.1		
-291.2		
-288		
-281.1		
-277.8		
-276.8		
-281.6		
-290.1		
-285.1		
-269.2		
-264.8		
-267.1		
-275.5		
-281.5		
-283.2		
-284.9		
-283.8		
-286.5		
-286.6		
-281.4		
-275.9		
-270		
-266.8		
-270.2		
-280.8		
-288.5		
-287.1		
-287.8		
-292.7		
-293.2		
-282		
-278.9		
-279.9		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		
Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS	
Year	Model ice Equiv
1505	0.17526
1504	0.32986
1503	0.1959
1502	0.27845
1501	0.38165
1500	0.25791
1499	0.19609
1498	0.30967
1497	0.2581
1496	0.16517
1495	0.34075
1494	0.09296
1493	0.15495
1492	0.41319
1491	0.26862
1490	0.31002
1489	0.2274
1488	0.25844
1487	0.1758
1486	0.2896
1485	0.22749
1484	0.24826
1483	0.10344
1482	0.32074
1481	0.19665
1480	0.24846
1479	0.42444
1478	0.06207
1477	0.22777
1476	0.23817
1475	0.19676
1474	0.13468
1473	0.19679

NGRIP 2004 - 50 year means - N. Greenland	
Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
Year	PC1 series
1488	-0.105
1487	0.495
1486	0.614
1485	-1.087
1484	0.867
1483	-0.674
1482	-1.524
1481	0.265
1480	-0.265
1479	1.706
1478	-0.118
1477	-0.069
1476	0.5
1475	-0.067
1474	-1.074
1473	0.872
1472	-0.924
1471	-1.602
1470	0.451
1469	1.728
1468	-0.132
1467	-0.789
1466	-0.336
1465	-1.164
1464	-0.179
1463	0.492
1462	-1.488
1461	-1.488
1460	-0.651
1459	0.722
1458	0.219
1457	0.227
1456	-0.768

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1456	-3.89			-86.12	.	.							1467	-0.336		
1455	-4.221			-95.19	.	.							1466	0.575		
1454	-3.248			-104.29	.	.							1465	0.472		
1453	-2.118			-113.421	.	.							1464	-0.139		
1452	-2.382			-122.582	.	.							1463	0.541		
1451	-1.735			-131.773	.	.							1462	0.131		
1450	-1.064			-141	.	.							1461	-0.5		
1449	-0.221			-150.25	.	.							1460	-0.111		
1448	0.3			-159.53	.	.							1459	0.417		
1447	2.998			-168.84	.	.							1458	0.588		
1446	2.107			-178.18	.	.							1457	1.126		
1445	0.676			-187.55	.	.							1456	0.861		
1444	-0.512			-196.95	.	.							1455	-0.064		
1443	-1.584			-206.38	.	.							1454	0.08		
1442	-0.766			-215.84	.	.							1453	0.518		
1441	-0.593			-225.33	.	.							1452	1.786		
1440	-0.655			-234.85	.	.							1451	-0.13		
1439	-0.729			-244.392	.	.							1450	1.002		
1438	0.201			-253.97	.	.							1449	0.058		
1437	0.658			-263.58	.	.							1448	-0.448		
1436	0.695			-273.21	.	.							1447	-0.498		
1435	-0.165			-282.874	.	.							1446	-0.095		
1434	-1.71			-292.57	.	.							1445	0.298		
1433	-2.433			-302.29	.	.							1444	0.628		
1432	-1.792			-312.04	.	.							1443	-0.17		
1431	-0.583			-321.82	.	.							1442	-0.342		
1430	1.324			-331.63	.	.							1441	0.628		
1429	2.181			-341.462	.	.							1440	0.313		
1428	2.555			-351.33	.	.							1439	0.154		
1427	1.859			-361.22	.	.							1438	-0.13		
1426	0.291			-371.14	.	.							1437	-0.395		
1425	-1.708			-381.09	.	.							1436	-0.362		
1424	-2.396			-391.07	.	.							1435	0.129		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1469	-18.72	1.4015				
								1468	-18.455	1.376				
								1467	-17.79	1.433				
								1466	-17.775	1.1925				
								1465	-18.2	1.4015				
								1464	-17.985	1.542				
								1463	-18.275	1.202				
								1462	-18.195	1.343				
								1461	-18.28	1.375				
								1460	-17.29	1.1305				
								1459	-18.205	1.0755				
								1458	-17.77	1.2465				
								1457	-18.14	0.9995				
								1456	-19.905	1.2525				
								1455	-18.79	1.087				
								1454	-20.585	1.3705				
								1453	-18.38	1.374				
								1452	-16.685	1.1135				
								1451	-16.44	1.494				
								1450	-16	1.4265				
								1449	-17.61	1.445				
								1448	-16.575	1.165				
								1447	-17.59	1.1675				
								1446	-17.6	1.142				
								1445	-18.44	1.2595				
								1444	-17.67	1.3775				
								1443	-17.195	1.2945				
								1442	-16.985	1.269				
								1441	-16.155	1.4455				
								1440	-17.28	1.276				
								1439	-17.505	1.541				
								1438	-18.015	1.472				
								1437	-17.895	1.387				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-275.1						1472	0.23835			1455	0.072
-262.7						1471	0.29021			1454	-0.059
-265.1						1470	0.16578			1453	-0.208
-273.1						1469	0.12434			1452	0.252
-279.6						1468	0.15552			1451	-0.303
-285.5						1467	0.14514			1450	0.377
-289.8						1466	0.26963			1449	0.855
-297.7						1465	0.25927			1448	0.269
-302.9						1464	0.2593			1447	0.144
-300.6						1463	0.16598			1446	1.469
-296.7						1462	0.19707			1445	0.725
-297.2						1461	0.23867			1444	0.165
-303.8						1460	0.30098			1443	-0.585
-306.7						1459	0.3944			1442	-0.61
-302.5						1458	0.19727			1441	0.097
-293.2						1457	0.32189			1440	-0.939
-286.9						1456	0.25962			1439	-0.932
-287.2						1455	0.31156			1438	-0.514
-287.8						1454	0.10393			1437	0.536
-289.6						1453	0.21817			1436	0.017
-290.1						1452	0.20779			1435	-0.511
-283.5						1451	0.30136			1434	-0.305
-277.3						1450	0.24946			1433	-0.141
-280.9						1449	0.10397			1432	0.767
-290.9						1448	0.31185			1431	-0.614
-296.5						1447	0.23912			1430	-0.215
-293.1						1446	0.23914			1429	-1.28
-288						1445	0.2704			1428	0.258
-288.9						1444	0.2393			1427	-0.447
-297.7						1443	0.23932			1426	0.499
-308						1442	0.12487			1425	-0.639
-310.7						1441	0.24977			1424	0.307
-305.9						1440	0.29147			1423	-0.209

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1423	-2.124			-401.071	.	.						1434	-0.222		
1422	-1.899			-411.104	.	.						1433	-0.499		
1421	-1.855			-421.164	.	.						1432	-0.326		
1420	-2.222			-431.251	.	.						1431	0.312		
1419	-2.304			-441.37	.	.						1430	0.322		
1418	-0.925			-451.51	.	.						1429	0.085		
1417	0.735			-461.68	.	.						1428	-0.368		
1416	0.555			-471.87	.	.						1427	-0.06		
1415	0.183			-482.093	.	.						1426	-0.149		
1414	-1.407			-492.342	.	.						1425	-0.24		
1413	-3.492			-502.62	.	.						1424	0.126		
1412	-3.762			-512.92	.	.						1423	-0.088		
1411	-3.747			-523.25	.	.						1422	-0.246		
1410	-2.857			-533.6	.	.						1421	-0.33		
1409	-2.407			-543.98	.	.						1420	0.04		
1408	-3.092			-554.383	.	.						1419	0.269		
1407	-3.117			-564.814	.	.						1418	0.682		
1406	-2.476			-575.27	.	.						1417	0.759		
1405	-0.976											1416	-0.006		
1404	1.07											1415	0.109		
1403	2.155											1414	0.898		
1402	2.658											1413	-0.071		
1401	2.538											1412	0.69		
1400	1.443											1411	0.529		
1399	0.253											1410	0.334		
1398	0.445											1409	0.388		
1397	-0.494											1408	0.565		
1396	-0.854											1407	-0.039		
1395	-1.524											1406	0.539		
1394	-2.197											1405	-0.038		
1393	-2.812											1404	-0.487		
1392	-3.356											1403	0.249		
1391	-2.243											1402	0.374		

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pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1436	-20.2	1.4635				
								1435	-18.85	1.1745				
								1434	-18.94	1.3245				
								1433	-17.955	1.2995				
								1432	-17.095	1.156				
								1431	-17.275	1.3345				
								1430	-17.755	1.31				
								1429	-17.235	1.6555				
								1428	-17.96	1.391				
								1427	-17.205	1.543				
								1426	-16.485	1.2765				
								1425	-18.025	1.28				
								1424	-17.34	1.433				
								1423	-17.71	1.2115				
								1422	-19.04	1.0645				
								1421	-18.265	1.615				
								1420	-18.435	1.2485				
								1419	-18.575	1.3755				
								1418	-18.505	1.2275				
								1417	-17.535	1.507				
								1416	-17.385	1.234				
								1415	-18.09	1.111				
								1414	-18.335	1.366				
								1413	-17.09	1.649				
								1412	-17.855	1.2465				
								1411	-16.52	1.48				
								1410	-17.245	1.3295				
								1409	-17.445	1.102				
								1408	-18.33	1.388				
								1407	-18.09	1.3915				
								1406	-18.745	1.1625				
								1405	-18.235	1.0615				
								1404	-16.2	1.247				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
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																					1418
																					1417
																					1416

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delta D mean annual	siple210.ant	O-18
-296.5		
-295.4		
-296.4		
-295.1		
-288.9		
-282.9		
-281.8		
-286.9		
-293.8		
-294.7		
-282.3		
-287.8		
-288.8		
-289.2		
-290.6		
-283.3		
-277.3		
-277		
-290.5		
-295.3		
-295.8		
-293.5		
-288.2		
-284.4		
-281.5		
-285.9		
-296.4		
-293.6		
-275.9		
-274.9		
-270.4		
-268.8		
-272.8		

Fisher, D.A.., 2002 - Siple Dome, Antarctica

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years

Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS

Year	Model ice Equiv
1439	0.33308
1438	0.1666
1437	0.13535
1436	0.34369
1435	0.23951
1434	0.27081
1433	0.2917
1432	0.20842
1431	0.21887
1430	0.35449
1429	0.35455
1428	0.29201
1427	0.19813
1426	0.22946
1425	0.25046
1424	0.30269
1423	0.28185
1422	0.2088
1421	0.27147
1420	0.21929
1419	0.30288
1418	0.22979
1417	0.26116
1416	0.33445
1415	0.26134
1414	0.1463
1413	0.30321
1412	0.25098
1411	0.20919
1410	0.33469
1409	0.30337
1408	0.21973
1407	0.17791

NGRIP 2004 - 50 year means - N. Greenland

Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index

Year	PC1 series
1422	0.385
1421	-0.382
1420	0.069
1419	0.772
1418	0.742
1417	0.866
1416	0.332
1415	-0.101
1414	0.993
1413	-0.363
1412	0.464
1411	0.917
1410	0.953
1409	0.723
1408	-0.998
1407	0.178
1406	0.489
1405	-0.503
1404	-0.606
1403	-0.35
1402	0.122
1401	-0.482
1400	0.238
1399	0.898
1398	0.074
1397	1.04
1396	1.004
1395	2.046
1394	0.486
1393	-0.219
1392	-0.411
1391	1.008
1390	0.631

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
1390	-2.174												1401	-0.644		
1389	-0.211												1400	-0.564		
1388	-0.916												1399	0.343		
1387	-1.958												1398	0.616		
1386	-1.896												1397	0.699		
1385	-1.675												1396	0.656		
1384	-1.337												1395	1.445		
1383	-0.676												1394	0.714		
1382	-0.08												1393	0.439		
1381	2.024												1392	0.369		
1380	2.403												1391	-0.3		
1379	2.901												1390	0.043		
1378	3.009												1389	0.254		
1377	2.424												1388	0.69		
1376	1.323												1387	-0.071		
1375	0.732												1386	-0.069		
1374	0.429												1385	-0.282		
1373	-0.355												1384	0.354		
1372	1.027												1383	-0.117		
1371	0.71												1382	-1.187		
1370	0.284												1381	-1.668		
1369	-0.168												1380	-1.862		
1368	-0.022												1379	-0.646		
1367	-0.142												1378	-0.853		
1366	-0.786												1377	-0.298		
1365	-1.7												1376	-0.943		
1364	-2.355												1375	-0.618		
1363	-2.274												1374	-0.622		
1362	-2.759												1373	-0.223		
1361	-2.654												1372	0.49		
1360	-2.113												1371	-0.064		
1359	-0.305												1370	-0.143		
1358	1.879												1369	1.42		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1403	-16.525	1.015				
								1402	-16.775	1.148				
								1401	-17.19	1.414				
								1400	-17.72	1.1285				
								1399	-17.93	1.4215				
								1398	-18.27	1.2925				
								1397	-18.975	1.5865				
								1396	-18.64	1.299				
								1395	-18.48	1.1685				
								1394	-18.32	1.5985				
								1393	-17.59	1.15				
								1392	-17.655	1.299				
								1391	-18.66	1.1805				
								1390	-17.955	1.5355				
								1389	-18.18	1.4025				
								1388	-18.065	0.9485				
								1387	-18.76	1.273				
								1386	-18.035	1.319				
								1385	-18.6	1.3365				
								1384	-19.005	1.6405				
								1383	-17.55	1.084				
								1382	-17.325	1.289				
								1381	-16.305	1.0475				
								1380	-17.19	1.331				
								1379	-17.15	1.3795				
								1378	-18.305	1.5245				
								1377	-16.86	1.5055				
								1376	-17.66	1.368				
								1375	-17.17	1.536				
								1374	-17.29	1.683				
								1373	-17.69	1.4				
								1372	-17.23	1.0725				
								1371	-16.685	1.5295				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1415
																					1414
																					1413
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																					1385
																					1384
																					1383

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18
-285.5		
-298.4		
-301.6		
-297.6		
-291.9		
-289.6		
-288.8		
-286.1		
-278.6		
-276.7		
-284.2		
-285.8		
-280.6		
-274.8		
-279.4		
-285.6		
-286.6		
-290		
-284.3		
-272.5		
-257.6		
-253.6		
-277.7		
-297.5		
-297.5		
-285.3		
-276.7		
-274.3		
-267.7		
-268.3		
-271.7		
-271.1		
-269.7		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		
Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS	
Year	Model ice Equiv
1406	0.2407
1405	0.19887
1404	0.15704
1403	0.33506
1402	0.20941
1401	0.17803
1400	0.2933
1399	0.24099
1398	0.37726
1397	0.1887
1396	0.22014
1395	0.23064
1394	0.27267
1393	0.24117
1392	0.38812
1391	0.28327
1390	0.30428
1389	0.17841
1388	0.27289
1387	0.17845
1386	0.30452
1385	0.14703
1384	0.30459
1383	0.26256
1382	0.30467
1381	0.11562
1380	0.26275
1379	0.33637
1378	0.24173
1377	0.26286
1376	0.3155
1375	0.23143
1374	0.28397

NGRIP 2004 - 50 year means - N. Greenland	
Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
Year	PC1 series
1389	1.453
1388	0.87
1387	-0.345
1386	0.236
1385	0.323
1384	0.561
1383	0.192
1382	1.179
1381	0.044
1380	-1.884
1379	-0.265
1378	-0.102
1377	-0.474
1376	-0.936
1375	-1.344
1374	-1.393
1373	-1.016
1372	-0.077
1371	0.174
1370	-0.067
1369	1.146
1368	-0.493
1367	-1.285
1366	0.016
1365	-0.283
1364	-1.274
1363	0.654
1362	0.085
1361	0.388
1360	0.207
1359	0.438
1358	0.838
1357	-1.182

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Fisher & Koerner 1995 - Agassiz Ice Cap

MGNORM.1yr	% MELT-NORMALIZED DEPARTURES
1357	2.715
1356	3.072
1355	3.328
1354	3.471
1353	3.711
1352	4.32
1351	4.437
1350	2.637
1349	2.133
1348	-2.01
1347	-1.816
1346	-0.786
1345	0.3
1344	1.121
1343	0.613
1342	0.042
1341	-1.522
1340	-1.599

Fisher & Koerner 1994 - Agassiz Ice Cap

pcnorm-5.all	% MELT-NORMALIZED DEPARTURES

Tarrussov 1992

YEAR	% melt: H(	% melt: H(	mean % M

Fisher, D.A., 2003 - N. Greenland

delnort3.stk	O-18

Fisher, D.A., 2002 - Devon Ice Cap

bld-1.dev

Fisher, D. A., 2003 - Devon Ice Cap

pc5bld.dev	% melt

Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)

delnorm6.cwg	O-18
1368	0.677
1367	-0.746
1366	-0.266
1365	-0.929
1364	-1.236
1363	-0.058
1362	-0.723
1361	-0.198
1360	-0.175
1359	0.219
1358	-0.227
1357	-0.082
1356	-1.268
1355	-0.845
1354	0.563
1353	-0.756
1352	-1.58
1351	-1.423
1350	-0.464
1349	-0.174
1348	0.222
1347	0.275
1346	0.349
1345	-0.413
1344	0.521
1343	0.235
1342	0.209
1341	-0.58
1340	-0.459
1339	0.499
1338	0.242
1337	-0.153
1336	-0.327

Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island

Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1370	-16.37	1.078				
								1369	-18.11	1.538				
								1368	-17.13	1.2505				
								1367	-17.655	1.4205				
								1366	-15.61	0.9425				
								1365	-16.375	1.2595				
								1364	-16.435	1.095				
								1363	-17.06	1.414				
								1362	-16.595	0.719				
								1361	-16.2	1.168				
								1360	-16.39	1.256				
								1359	-16.185	1.109				
								1358	-17.11	1.301				
								1357	-16.625	0.964				
								1356	-16.355	1.3355				
								1355	-16.235	1.358				
								1354	-16.235	1.685				
								1353	-17.745	1.2975				
								1352	-17.72	1.368				
								1351	-18.885	1.44				
								1350	-19.275	1.307				
								1349	-19.935	1.3105				
								1348	-18.625	1.296				
								1347	-19.07	1.3165				
								1346	-17.645	1.32				
								1345	-17.34	1.3065				
								1344	-17.85	1.1525				
								1343	-17.985	1.4005				
								1342	-18.745	1.2455				
								1341	-20.165	1.495				
								1340	-20.785	1.6745				
								1339	-19.33	1.0225				
								1338	-17.8	1.3305				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1382
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-278.6						1373	0.24199			1356	-0.471
-286						1372	0.19989			1355	1.686
-288.4						1371	0.26306			1354	0.66
-286.8						1370	0.16842			1353	-0.898
-279.1						1369	0.27373			1352	-1.796
-287.9						1368	0.27376			1351	-0.87
-286.9						1367	0.23165			1350	0.759
-297.1						1366	0.26332			1349	-0.245
-305.8						1365	0.36871			1348	1.19
-302.2						1364	0.24226			1347	0.636
-291.2						1363	0.26343			1346	-0.276
-284.5						1362	0.25294			1345	-0.11
-265.5						1361	0.21079			1344	-0.091
-273.5						1360	0.22133			1343	0.032
-289.4						1359	0.2425			1342	-0.205
-284.3						1358	0.2319			1341	0.203
-280.2						1357	0.21088			1340	-0.343
-282.5						1356	0.31637			1339	1.491
-281.8						1355	0.22146			1338	-0.301
-278						1354	0.20043			1337	-1.92
-282.9						1353	0.29542			1336	-0.101
-293.1						1352	0.29547			1335	0.704
-295.6						1351	0.22168			1334	-0.402
-289.7						1350	0.23223			1333	1.343
-294						1349	0.20055			1332	-1.077
-294						1348	0.25335			1331	-0.407
-289.1						1347	0.17952			1330	0.218
-268						1346	0.29566			1329	0.512
-267.7						1345	0.31689			1328	-0.768
-273						1344	0.26413			1327	0.266
-274						1343	0.28525			1326	1.72
-269.7						1342	0.23246			1325	0.737
-267.2						1341	0.20075			1324	0.191

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1335	0.538		
													1334	-0.152		
													1333	-0.204		
													1332	-0.076		
													1331	-0.538		
													1330	-0.798		
													1329	0.132		
													1328	-0.454		
													1327	-0.89		
													1326	-0.085		
													1325	0.244		
													1324	-0.046		
													1323	-0.372		
													1322	-0.96		
													1321	-0.594		
													1320	-0.365		
													1319	0.062		
													1318	-0.361		
													1317	-0.096		
													1316	-0.375		
													1315	-0.095		
													1314	0.19		
													1313	-0.472		
													1312	-0.221		
													1311	-0.148		
													1310	-0.525		
													1309	0.123		
													1308	0.904		
													1307	0.782		
													1306	0.572		
													1305	0.667		
													1304	-0.158		
													1303	-0.448		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1337	-15.905	1.51				
								1336	-15.95	0.853				
								1335	-16.285	1.8565				
								1334	-17.365	1.359				
								1333	-17.52	1.362				
								1332	-17.055	1.351				
								1331	-16.57	1.369				
								1330	-18.45	1.3585				
								1329	-18.35	1.3755				
								1328	-18.12	1.3655				
								1327	-19.615	1.7275				
								1326	-16.95	1.3855				
								1325	-16.95	0.8615				
								1324	-16.09	1.3795				
								1323	-17.135	1.3955				
								1322	-16.45	1.3865				
								1321	-16.45	1.113				
								1320	-17.45	1.4845				
								1319	-17.78	1.1475				
								1318	-17.335	1.492				
								1317	-16.4	1.831				
								1316	-16.305	1.4295				
								1315	-16.215	1.1475				
								1314	-16.215	1.08				
								1313	-18.665	1.4185				
								1312	-16.525	1.4325				
								1311	-16.825	1.3535				
								1310	-17.72	1.6235				
								1309	-18.3	1.6175				
								1308	-18.08	1.3525				
								1307	-17.145	1.3565				
								1306	-16.855	1.7225				
								1305	-17.625	1.4475				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D. A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D. A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1349
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-276.1						1340	0.26425			1323	-0.991
-274.6						1339	0.21145			1322	-1.993
-268.6						1338	0.24322			1321	0.019
-273.2						1337	0.30665			1320	-0.13
-284.9						1336	0.26438			1319	-1.205
-295.7						1335	0.26442			1318	-0.142
-297.4						1334	0.22213			1317	-0.689
-291.5						1333	0.30681			1316	0.524
-290.2						1332	0.21163			1315	0.326
-297.3						1331	0.15876			1314	-1.643
-290.6						1330	0.27523			1313	-1.3
-296						1329	0.23292			1312	0.018
-312.4						1328	0.22228			1311	0.025
-277						1327	0.23297			1310	-1.118
-289.5						1326	0.39188			1309	0.25
-297.8						1325	0.19068			1308	2.186
-292.2						1324	0.21183			1307	0.471
-292.2						1323	0.21185			1306	1.013
-296.4						1322	0.36026			1305	0.51
-301.2						1321	0.25429			1304	-0.023
-304.7						1320	0.16954			1303	0.688
-303.6						1319	0.19081			1302	-0.716
-298.1						1318	0.23322			1301	0.257
-295.7						1317	0.28623			1300	0.329
-298.2						1316	0.28627			1299	-0.604
-299.7						1315	0.20148			1298	-1.085
-295.1						1314	0.23334			1297	-0.085
-293.5						1313	0.20152			1296	0.153
-294.7						1312	0.3501			1295	0.77
-293.7						1311	0.21226			1294	-0.261
-285.4						1310	0.24403			1293	-1.204
-280.7						1309	0.24406			1292	-0.105
-281.4						1308	0.2335			1291	-0.577

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												1302	0.603		
												1301	-0.314		
												1300	0.521		
												1299	0.179		
												1298	-0.493		
												1297	-0.592		
												1296	-0.112		
												1295	0.426		
												1294	0.669		
												1293	-0.979		
												1292	-0.312		
												1291	-0.427		
												1290	-0.474		
												1289	-0.108		
												1288	0.17		
												1287	0.593		
												1286	0.466		
												1285	0.535		
												1284	-0.638		
												1283	0.283		
												1282	0.482		
												1281	0.734		
												1280	1.403		
												1279	0.464		
												1278	0.299		
												1277	-0.033		
												1276	-0.267		
												1275	0.233		
												1274	0.63		
												1273	-0.052		
												1272	0.571		
												1271	-0.073		
												1270	-0.406		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1304	-18.715	1.3655				
								1303	-17.23	1.743				
								1302	-18.095	1.466				
								1301	-18.2	1.657				
								1300	-18.41	1.473				
								1299	-18.86	1.5705				
								1298	-19.1	1.0085				
								1297	-18.36	1.476				
								1296	-18.615	1.2975				
								1295	-18.355	1.3005				
								1294	-18.22	0.93				
								1293	-18.15	1.3065				
								1292	-17.825	1.0325				
								1291	-17.315	0.847				
								1290	-18.29	1.1355				
								1289	-18.04	1.2255				
								1288	-18.075	1.4155				
								1287	-18.14	1.3275				
								1286	-19.72	1.1405				
								1285	-18.975	1.3315				
								1284	-17.045	1.431				
								1283	-17.665	0.9545				
								1282	-17.13	0.961				
								1281	-17.59	1.344				
								1280	-18.955	1.1555				
								1279	-17.875	1.2525				
								1278	-16.49	0.9665				
								1277	-17.96	1.4535				
								1276	-17.11	1.5525				
								1275	-17.045	1.2665				
								1274	-18.35	1.073				
								1273	-18.405	0.881				
								1272	-18.495	1.078				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1316
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18
-278.5		
-271.8		
-266.9		
-265.3		
-270.5		
-277.1		
-283		
-284.6		
-282.2		
-277.2		
-276.4		
-282.3		
-286.6		
-285.8		
-284.7		
-283		
-286		
-292.2		
-296.3		
-300.6		
-300.3		
-295.3		
-284.9		
-284.2		
-288.1		
-290.3		
-282		
-277.8		
-275.1		
-280.6		
-290.1		
-290.6		
-281.1		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		
Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS	
Year	Model ice Equiv
1307	0.21236
1306	0.21238
1305	0.29733
1304	0.31866
1303	0.24435
1302	0.21249
1301	0.255
1300	0.18064
1299	0.15936
1298	0.34007
1297	0.25511
1296	0.26574
1295	0.19135
1294	0.2552
1293	0.22331
1292	0.22333
1291	0.23407
1290	0.27664
1289	0.20219
1288	0.15967
1287	0.22345
1286	0.36187
1285	0.29803
1284	0.18098
1283	0.25552
1282	0.22359
1281	0.26631
1280	0.22365
1279	0.26637
1278	0.19183
1277	0.29841
1276	0.25574
1275	0.22389

NGRIP 2004 - 50 year means - N. Greenland	
Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
Year	PC1 series
1290	0.872
1289	-0.852
1288	-1.067
1287	0.21
1286	1.259
1285	-0.178
1284	-1.165
1283	0.777
1282	-0.094
1281	0.854
1280	2.258
1279	-0.965
1278	-0.279
1277	-1.88
1276	1.25
1275	0.647
1274	0.343
1273	0.364
1272	0.647
1271	-0.817
1270	0.249
1269	0.91
1268	-0.978
1267	-0.504
1266	-0.119
1265	-1.219
1264	-1.092
1263	-1.112
1262	-0.995
1261	-0.621
1260	-1.039
1259	-0.501
1258	0.454

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1269	0.488		
													1268	-0.292		
													1267	0.654		
													1266	-0.367		
													1265	-1.293		
													1264	-0.57		
													1263	-1.399		
													1262	-1.268		
													1261	-0.774		
													1260	0.289		
													1259	-0.265		
													1258	-0.162		
													1257	-0.636		
													1256	0.011		
													1255	-0.058		
													1254	1.276		
													1253	1.831		
													1252	0.017		
													1251	-1.209		
													1250	0.349		
													1249	1.242		
													1248	0.259		
													1247	-0.66		
													1246	-0.893		
													1245	-0.484		
													1244	-0.399		
													1243	-0.351		
													1242	-0.212		
													1241	-0.281		
													1240	0.174		
													1239	0.224		
													1238	1.077		
													1237	-0.041		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1271	-17.895	1.2765				
								1270	-18.135	1.378				
								1269	-18.62	1.282				
								1268	-18.17	1.384				
								1267	-18.725	1.3875				
								1266	-18.135	1.0925				
								1265	-17.85	1.194				
								1264	-17.855	1.396				
								1263	-19.24	1.0995				
								1262	-19.575	1.3025				
								1261	-19.075	1.4055				
								1260	-17.73	1.6105				
								1259	-15.845	1.0085				
								1258	-17.565	1.313				
								1257	-18.02	1.6215				
								1256	-17.73	1.421				
								1255	-17.4	1.1005				
								1254	-17.755	1.3055				
								1253	-15.715	1.225				
								1252	-16.54	1.1055				
								1251	-17.97	1.7445				
								1250	-16.84	1.4395				
								1249	-15.03	0.9255				
								1248	-16.89	1.1355				
								1247	-17.88	1.4525				
								1246	-18.04	1.243				
								1245	-18.56	1.249				
								1244	-18.315	1.252				
								1243	-18.465	0.7305				
								1242	-17.545	1.2535				
								1241	-18.595	1.6785				
								1240	-18.05	1.258				
								1239	-18.585	1.6855				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1283
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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18
-290.4		
-300.5		
-297.9		
-295.1		
-282.6		
-287.6		
-276.8		
-286.4		
-299.2		
-296.2		
-283		
-294		
-294.3		
-281.8		
-283.1		
-294		
-289.6		
-289.8		
-299.2		
-288.6		
-282.9		
-296.8		
-302.6		
-291.5		
-282.2		
-292.4		
-298		
-303.2		
-295.7		
-278.6		
-272.9		
-262.5		
-263.3		

Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		
Year	dD, per mil	Accumulation, g cm-2 yr-1

Meese et al., 1994 (revised): GIS	
Year	Model ice Equiv
1274	0.2558
1273	0.26657
1272	0.2986
1271	0.27727
1270	0.21329
1269	0.20268
1268	0.26673
1267	0.21336
1266	0.22413
1265	0.22415
1264	0.22418
1263	0.27752
1262	0.24552
1261	0.19222
1260	0.24557
1259	0.267
1258	0.25639
1257	0.24566
1256	0.18168
1255	0.27777
1254	0.24574
1253	0.22446
1252	0.0962
1251	0.2245
1250	0.23518
1249	0.27806
1248	0.25667
1247	0.20318
1246	0.29948
1245	0.22466
1244	0.20325
1243	0.33169
1242	0.2783

NGRIP 2004 - 50 year means - N. Greenland	
Year	Del 18O permille

Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
Year	PC1 series
1257	0.389
1256	0.523
1255	0.91
1254	1.712
1253	0.031
1252	0.179
1251	-0.485
1250	2.373
1249	0.025
1248	-0.38
1247	-0.284
1246	0.45
1245	0.572

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1236	-0.45		
													1235	0.119		
													1234	0.4		
													1233	0.023		
													1232	-0.421		
													1231	0.461		
													1230	0.318		
													1229	-1.395		
													1228	-1.106		
													1227	-0.276		
													1226	-0.129		
													1225	0.49		
													1224	1.764		
													1223	0.869		
													1222	1.85		
													1221	1.184		
													1220	0.382		
													1219	0.313		
													1218	-0.317		
													1217	-1.201		
													1216	0.229		
													1215	0.885		
													1214	0.642		
													1213	0.456		
													1212	0.331		
													1211	-0.805		
													1210	0.475		
													1209	2.133		
													1208	-0.28		
													1207	-0.328		
													1206	1.139		
													1205	1.125		
													1204	-0.063		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1238	-17.425	1.3725				
								1237	-19.27	1.375				
								1236	-18.61	1.581				
								1235	-18.015	1.584				
								1234	-17.43	2.0175				
								1233	-18.325	1.387				
								1232	-18.875	0.9635				
								1231	-16.57	1.179				
								1230	-16.365	1.181				
								1229	-17.19	1.405				
								1228	-16.9	1.288				
								1227	-18.395	1.298				
								1226	-18.72	1.399				
								1225	-18.09	1.1825				
								1224	-17.99	1.0855				
								1223	-16.485	1.5215				
								1222	-15.84	1.631				
								1221	-16.585	1.199				
								1220	-17.82	1.193				
								1219	-18.295	1.9705				
								1218	-17.785	1.4205				
								1217	-17.97	1.4405				
								1216	-18.805	1.0935				
								1215	-16.345	1.3205				
								1214	-15.375	1.323				
								1213	-16.365	1.325				
								1212	-17.845	1.2195				
								1211	-18.5	1.1035				
								1210	-17.705	1.106				
								1209	-18.595	1.2265				
								1208	-19.475	1.5655				
								1207	-18.545	1.3395				
								1206	-18.285	1.9095				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica	
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years	A.D.
																					1250
																					1249
																					1248
																					1247
																					1246
																					1245
																					1244
																					1243
																					1242
																					1241
																					1240
																					1239
																					1238
																					1237
																					1236
																					1235
																					1234
																					1233
																					1232
																					1231
																					1230
																					1229
																					1228
																					1227
																					1226
																					1225
																					1224
																					1223
																					1222
																					1221
																					1220
																					1219
																					1218

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica siple210.ant	O-18	Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years Year	dD, per mil	Accumulation, g cm-2 yr-1	Meese et al., 1994 (revised): GIS Year	Model ice Equiv	NGRIP 2004 - 50 year means - N. Greenland Year	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index Year	PC1 series
-274.5						1241	0.23544				
-280						1240	0.26759				
-285.7						1239	0.22483				
-288.5						1238	0.22485				
-283.5						1237	0.23555				
-278.7						1236	0.24636				
-282.8						1235	0.17133				
-301.2						1234	0.28923				
-304.4						1233	0.22498				
-306.4						1232	0.27862				
-292.6						1231	0.31081				
-271						1230	0.18223				
-275.8						1229	0.20361				
-272.1						1228	0.28944				
-269						1227	0.20366				
-275.5						1226	0.17151				
-284.1						1225	0.27884				
-287.4						1224	0.21452				
-290.3						1223	0.24673				
-291.4						1222	0.19308				
-295.4						1221	0.1824				
-294.3						1220	0.13943				
-291.7						1219	0.19313				
-291.1						1218	0.26834				
-292.8						1217	0.24687				
-283.6						1216	0.2147				
-281.6						1215	0.32204				
-275						1214	0.23626				
-290.2						1213	0.2577				
-294.2						1212	0.25773				
-288.3						1211	0.23635				
-286.3						1210	0.11818				
-282.5						1209	0.17193				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1203	-0.642		
													1202	-1.148		
													1201	-1.089		
													1200	0.124		
													1199	0.21		
													1198	0.838		
													1197	1.225		
													1196	-0.864		
													1195	-0.749		
													1194	0.5		
													1193	0.363		
													1192	-0.611		
													1191	-1.018		
													1190	-0.354		
													1189	0.135		
													1188	0.072		
													1187	-0.411		
													1186	-0.676		
													1185	-1.231		
													1184	-0.517		
													1183	-0.263		
													1182	-0.164		
													1181	0.426		
													1180	-0.221		
													1179	-0.207		
													1178	-0.691		
													1177	0.479		
													1176	1.602		
													1175	1.303		
													1174	0.24		
													1173	-0.243		
													1172	-0.823		
													1171	0.048		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1205	-17.745	1.684				
								1204	-17.44	0.7885				
								1203	-17.44	0.8995				
								1202	-17.74	1.352				
								1201	-18.05	1.3655				
								1200	-18.32	1.3675				
								1199	-18.155	1.481				
								1198	-17.52	0.9075				
								1197	-19.015	1.486				
								1196	-18.8	1.6				
								1195	-18.065	1.492				
								1194	-17.49	1.2595				
								1193	-18.17	1.1505				
								1192	-18.135	1.3875				
								1191	-17.955	1.266				
								1190	-17.515	0.909				
								1189	-18.43	1.0345				
								1188	-18	1.7225				
								1187	-18.12	1.5125				
								1186	-18.035	1.4925				
								1185	-17.955	1.505				
								1184	-17.73	1.508				
								1183	-18.05	1.397				
								1182	-17.745	1.292				
								1181	-16.535	1.5085				
								1180	-17.245	1.29				
								1179	-18.735	2.1025				
								1178	-19.94	1.536				
								1177	-19.75	1.424				
								1176	-18.685	1.2855				
								1175	-17.845	1.759				
								1174	-16.365	1.188				
								1173	-17.57	1.305				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
-282						1208	0.05374				
						1207	0.23642				
						1206	0.31163				
						1205	0.23648				
						1204	0.22568				
						1203	0.24724				
						1202	0.22574				
						1201	0.29038				
						1200	0.30114				
						1199	0.22582				
						1198	0.17214				
						1197	0.22587				
						1196	0.21517				
						1195	0.2583				
						1194	0.21522				
						1193	0.21524				
						1192	0.1937				
						1191	0.27987				
						1190	0.25845				
						1189	0.19377				
						1188	0.23693				
						1187	0.24769				
						1186	0.25856				
						1185	0.24775				
						1184	0.21546				
						1183	0.24781				
						1182	0.21551				
						1181	0.23712				
						1180	0.19397				
						1179	0.28025				
						1178	0.22635				
						1177	0.25883				
						1176	0.21566				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												1170	0.051		
												1169	-0.13		
												1168	-1.438		
												1167	-0.526		
												1166	0.265		
												1165	-0.228		
												1164	0.542		
												1163	0.84		
												1162	-1.52		
												1161	-0.665		
												1160	0.379		
												1159	-0.058		
												1158	-0.492		
												1157	0.093		
												1156	0.346		
												1155	-0.567		
												1154	-0.762		
												1153	-0.967		
												1152	-1.144		
												1151	-0.684		
												1150	-0.469		
												1149	-0.661		
												1148	-0.482		
												1147	0.088		
												1146	0.571		
												1145	0.449		
												1144	0.763		
												1143	0.429		
												1142	-0.501		
												1141	0.568		
												1140	0.273		
												1139	-0.569		
												1138	0.503		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1172	-17.485	1.192				
								1171	-17.055	1.4245				
								1170	-18	0.836				
								1169	-17.42	1.558				
								1168	-17.03	1.431				
								1167	-17.69	1.4335				
								1166	-17.505	1.203				
								1165	-17.63	1.931				
								1164	-17.465	1.0765				
								1163	-19.2	1.559				
								1162	-19.135	1.8235				
								1161	-18.245	1.3295				
								1160	-18.235	1.8005				
								1159	-18.405	1.216				
								1158	-17.01	1.336				
								1157	-17.13	1.206				
								1156	-17.115	1.4715				
								1155	-17.775	1.592				
								1154	-16.725	1.699				
								1153	-16.82	1.4645				
								1152	-17.15	1.3475				
								1151	-17.53	1.2165				
								1150	-17.1	1.604				
								1149	-16.665	1.354				
								1148	-18.215	0.9835				
								1147	-17.985	1.3575				
								1146	-17.485	1.479				
								1145	-17.485	0.9875				
								1144	-17.775	1.738				
								1143	-17.375	1.245				
								1142	-17.35	1.6225				
								1141	-17.435	1.249				
								1140	-17.14	1.357				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						1175	0.19408				
						1174	0.2157				
						1173	0.25894				
						1172	0.16178				
						1171	0.16179				
						1170	0.21578				
						1169	0.36691				
						1168	0.18347				
						1167	0.23749				
						1166	0.24827				
						1165	0.20516				
						1164	0.18355				
						1163	0.21596				
						1162	0.24837				
						1161	0.25928				
						1160	0.24843				
						1159	0.32416				
						1158	0.19445				
						1157	0.27017				
						1156	0.29186				
						1155	0.2919				
						1154	0.2162				
						1153	0.17302				
						1152	0.2379				
						1151	0.23793				
						1150	0.23795				
						1149	0.32454				
						1148	0.21635				
						1147	0.25972				
						1146	0.24886				
						1145	0.25978				
						1144	0.24892				
						1143	0.24895				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1137	0.24		
													1136	0.432		
													1135	0.687		
													1134	1.024		
													1133	1.395		
													1132	1.507		
													1131	0.16		
													1130	-0.314		
													1129	-0.492		
													1128	-0.292		
													1127	1.145		
													1126	-0.334		
													1125	0.419		
													1124	1.503		
													1123	0.472		
													1122	0.088		
													1121	0.465		
													1120	0.777		
													1119	0.23		
													1118	-0.309		
													1117	0.555		
													1116	0.676		
													1115	-0.045		
													1114	-1.206		
													1113	-0.557		
													1112	-0.161		
													1111	-0.149		
													1110	0.195		
													1109	-0.761		
													1108	-0.489		
													1107	-0.651		
													1106	-0.837		
													1105	0.175		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1139	-18.37	1.494				
								1138	-18.105	1.361				
								1137	-18.16	1.512				
								1136	-18.02	1.5005				
								1135	-18.185	1.5025				
								1134	-18.195	1.1245				
								1133	-16.685	1.3845				
								1132	-17.97	1.6305				
								1131	-17.93	1.143				
								1130	-17.665	1.635				
								1129	-17.665	1.1325				
								1128	-16.835	1.148				
								1127	-16.605	1.6555				
								1126	-17.09	1.274				
								1125	-18.195	1.5225				
								1124	-15.16	1.512				
								1123	-17.525	1.527				
								1122	-18.295	1.4045				
								1121	-18.17	1.506				
								1120	-17.58	1.657				
								1119	-16.95	1.2855				
								1118	-17.195	1.412				
								1117	-17.075	0.9005				
								1116	-16.675	1.804				
								1115	-16.99	1.793				
								1114	-16.71	1.294				
								1113	-16.71	1.295				
								1112	-17.085	1.158				
								1111	-17.085	1.2985				
								1110	-17.21	1.944				
								1109	-16.395	1.036				
								1108	-16.895	1.1765				
								1107	-17.635	1.3045				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						1142	0.31393				
						1141	0.29239				
						1140	0.27074				
						1139	0.25999				
						1138	0.20583				
						1137	0.26004				
						1136	0.32508				
						1135	0.32513				
						1134	0.23845				
						1133	0.3035				
						1132	0.19508				
						1131	0.26025				
						1130	0.28189				
						1129	0.28193				
						1128	0.2169				
						1127	0.30373				
						1126	0.16269				
						1125	0.3038				
						1124	0.23874				
						1123	0.24958				
						1122	0.2388				
						1121	0.16278				
						1120	0.26059				
						1119	0.17374				
						1118	0.27147				
						1117	0.16285				
						1116	0.29328				
						1115	0.34766				
						1114	0.23902				
						1113	0.31517				
						1112	0.20649				
						1111	0.35868				
						1110	0.26092				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1104	0.254		
													1103	0.261		
													1102	-0.495		
													1101	-0.827		
													1100	0.258		
													1099	0.506		
													1098	0.477		
													1097	0.328		
													1096	0.76		
													1095	0.114		
													1094	-0.162		
													1093	-0.042		
													1092	-0.054		
													1091	0.755		
													1090	-0.352		
													1089	-0.154		
													1088	0.2		
													1087	0.762		
													1086	0.31		
													1085	-0.001		
													1084	-0.188		
													1083	0.251		
													1082	0.738		
													1081	0.623		
													1080	0.03		
													1079	-0.024		
													1078	-1.136		
													1077	-1.224		
													1076	-0.411		
													1075	-0.161		
													1074	-0.17		
													1073	-0.37		
													1072	-1.15		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1106	-16.95	1.1795				
								1105	-17.175	1.308				
								1104	-18.085	1.1825				
								1103	-18.085	1.038				
								1102	-17.095	1.1725				
								1101	-17.095	1.1805				
								1100	-19.06	1.3155				
								1099	-19.06	1.061				
								1098	-19.545	1.447				
								1097	-19.37	1.32				
								1096	-18.04	1.579				
								1095	-17.15	1.441				
								1094	-18.01	1.9815				
								1093	-18.01	1.326				
								1092	-17.335	1.058				
								1091	-17.635	1.459				
								1090	-17.335	0.9305				
								1089	-16.835	1.332				
								1088	-17.97	1.464				
								1087	-18.1	1.4655				
								1086	-17.94	1.467				
								1085	-18.52	1.469				
								1084	-17.755	1.34				
								1083	-18.075	1.6035				
								1082	-18.075	1.4735				
								1081	-18.165	1.344				
								1080	-17.805	1.468				
								1079	-17.15	1.4695				
								1078	-16.735	1.49				
								1077	-16.58	1.6145				
								1076	-16.58	0.804				
								1075	-16.935	1.0785				
								1074	-16.935	1.62				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						1109	0.25012				
						1108	0.26098				
						1107	0.25018				
						1106	0.26105				
						1105	0.25024				
						1104	0.21754				
						1103	0.2503				
						1102	0.23938				
						1101	0.29384				
						1100	0.2068				
						1099	0.30487				
						1098	0.2395				
						1097	0.28314				
						1096	0.18509				
						1095	0.28321				
						1094	0.31592				
						1093	0.45764				
						1092	0.19617				
						1091	0.25069				
						1090	0.25072				
						1089	0.22892				
						1088	0.22895				
						1087	0.22897				
						1086	0.21813				
						1085	0.22902				
						1084	0.22905				
						1083	0.22907				
						1082	0.2291				
						1081	0.22912				
						1080	0.21828				
						1079	0.22917				
						1078	0.2292				
						1077	0.22922				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1071	-0.582		
													1070	0.791		
													1069	1.421		
													1068	0.362		
													1067	-0.281		
													1066	-0.59		
													1065	-0.574		
													1064	-0.222		
													1063	-0.417		
													1062	0.3		
													1061	-0.492		
													1060	-1.525		
													1059	-0.597		
													1058	1.16		
													1057	-1.035		
													1056	-0.322		
													1055	-0.716		
													1054	-0.029		
													1053	0.725		
													1052	-0.616		
													1051	-0.053		
													1050	0.101		
													1049	-0.134		
													1048	0.052		
													1047	1.369		
													1046	-0.782		
													1045	-0.467		
													1044	0.803		
													1043	1.779		
													1042	0.412		
													1041	-0.685		
													1040	-0.126		
													1039	1.108		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1073	-17.57	1.3555				
								1072	-15.555	1.349				
								1071	-15.37	1.6255				
								1070	-16.65	1.085				
								1069	-17.215	1.629				
								1068	-17.775	1.9065				
								1067	-16.945	1.3645				
								1066	-16.16	1.224				
								1065	-17.965	1.5015				
								1064	-17.965	1.092				
								1063	-16.735	1.785				
								1062	-18.315	1.098				
								1061	-18.315	1.238				
								1060	-18.45	1.2325				
								1059	-19.74	1.4835				
								1058	-17.68	1.513				
								1057	-17.68	1.2365				
								1056	-18.34	1.2435				
								1055	-18.34	1.218				
								1054	-18.13	2.0715				
								1053	-17.265	0.9405				
								1052	-17.265	1.1065				
								1051	-17.17	1.387				
								1050	-17.17	1.109				
								1049	-17.235	1.11				
								1048	-17.995	1.1115				
								1047	-18.32	1.5305				
								1046	-17.995	1.1135				
								1045	-17.025	1.2575				
								1044	-17.22	1.397				
								1043	-17.625	1.256				
								1042	-17.71	1.261				
								1041	-17.71	0.9805				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year		Year	PC1 series
					1076	0.24024				
					1075	0.19653				
					1074	0.13107				
					1073	0.20755				
					1072	0.21846				
					1071	0.21848				
					1070	0.29501				
					1069	0.19666				
					1068	0.16391				
					1067	0.25134				
					1066	0.36069				
					1065	0.2733				
					1064	0.20777				
					1063	0.30626				
					1062	0.3391				
					1061	0.26255				
					1060	0.4048				
					1059	0.12041				
					1058	0.16412				
					1057	0.29549				
					1056	0.36127				
					1055	0.29558				
					1054	0.22997				
					1053	0.20807				
					1052	0.28478				
					1051	0.39436				
					1050	0.15339				
					1049	0.13147				
					1048	0.28491				
					1047	0.263				
					1046	0.26303				
					1045	0.31798				
					1044	0.2631				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												1038	-0.365		
												1037	0.308		
												1036	-0.164		
												1035	-1.378		
												1034	-0.63		
												1033	-0.632		
												1032	-0.2		
												1031	-0.124		
												1030	-0.329		
												1029	-1.141		
												1028	0.372		
												1027	0.136		
												1026	-1.38		
												1025	-1.542		
												1024	-0.549		
												1023	0.932		
												1022	-0.713		
												1021	0.828		
												1020	0.443		
												1019	1.14		
												1018	-0.545		
												1017	-0.243		
												1016	0.608		
												1015	1.732		
												1014	0.867		
												1013	-0.695		
												1012	-1.508		
												1011	0.654		
												1010	0.573		
												1009	1.219		
												1008	-0.299		
												1007	1.594		
												1006	1.157		

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pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1040	-18.425	1.5385				
								1039	-18.13	1.4045				
								1038	-19.035	1.266				
								1037	-18.06	1.5465				
								1036	-17.915	1.5485				
								1035	-17.795	1.2695				
								1034	-18.985	1.692				
								1033	-18.365	1.1295				
								1032	-17.46	1.414				
								1031	-17.375	1.5565				
								1030	-17.725	1.2735				
								1029	-17.24	1.275				
								1028	-17.45	1.9855				
								1027	-17.68	0.853				
								1026	-17.38	1.5645				
								1025	-18.3	1.281				
								1024	-19.46	1.2835				
								1023	-17.885	1.8545				
								1022	-17.65	1.2855				
								1021	-17.475	1.43				
								1020	-17.98	1.431				
								1019	-16.91	1.719				
								1018	-17.12	1.864				
								1017	-17.12	1.292				
								1016	-17.835	1.2935				
								1015	-17.575	1.5825				
								1014	-17.58	1.441				
								1013	-18.205	1.1535				
								1012	-18.205	1.155				
								1011	-18.28	1.0115				
								1010	-18.67	1.1575				
								1009	-18.16	1.3055				
								1008	-17.215	1.16				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						1043	0.30703				
						1042	0.26328				
						1041	0.19745				
						1040	0.38393				
						1039	0.25234				
						1038	0.24144				
						1037	0.26343				
						1036	0.16467				
						1035	0.35125				
						1034	0.25248				
						1033	0.19763				
						1032	0.26358				
						1031	0.17569				
						1030	0.2306				
						1029	0.14281				
						1028	0.20877				
						1027	0.35164				
						1026	0.18683				
						1025	0.20884				
						1024	0.17581				
						1023	0.34073				
						1022	0.29679				
						1021	0.30788				
						1020	0.23096				
						1019	0.28595				
						1018	0.43995				
						1017	0.28604				
						1016	0.23109				
						1015	0.33014				
						1014	0.20912				
						1013	0.25319				
						1012	0.20917				
						1011	0.24217				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													1005	0.854		
													1004	-0.694		
													1003	-1.14		
													1002	0.001		
													1001	0.887		
													1000	0.028		
													999	-0.889		
													998	-0.802		
													997	-1.219		
													996	-0.634		
													995	-0.996		
													994	0.777		
													993	0.228		
													992	0.15		
													991	0.451		
													990	-0.005		
													989	-0.027		
													988	1.825		
													987	0.509		
													986	-0.154		
													985	0.139		
													984	0.544		
													983	-0.225		
													982	-0.023		
													981	-0.671		
													980	0.158		
													979	0.718		
													978	1.156		
													977	-0.315		
													976	0.44		
													975	-0.001		
													974	0.353		
													973	-0.802		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								1007	-17.295	1.7415				
								1006	-17.795	1.4535				
								1005	-18.21	1.5995				
								1004	-18.475	1.7475				
								1003	-18.285	1.6025				
								1002	-18.855	1.607				
								1001	-17.795	1.606				
								1000	-17.795	0.8785				
								999	-17.795	1.465				
								998	-17.18	1.7555				
								997	-18.72	1.4685				
								996	-17.91	1.3195				
								995	-17.065	1.6165				
								994	-17.415	1.622				
								993	-16.425	1.298				
								992	-16.425	0.8835				
								991	-16.515	1.33				
								990	-16.89	1.4505				
								989	-17.88	1.478				
								988	-17.88	1.1855				
								987	-17.215	1.1865				
								986	-16.98	1.6325				
								985	-16.665	0.8895				
								984	-16.575	1.491				
								983	-17.785	1.347				
								982	-17.93	1.043				
								981	-17.65	1.9425				
								980	-17.915	1.6435				
								979	-17.65	1.0465				
								978	-17.145	1.35				
								977	-18.045	1.649				
								976	-18.045	1.3535				
								975	-17.82	1.5065				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						1010	0.28626				
						1009	0.2533				
						1008	0.28633				
						1007	0.24229				
						1006	0.25339				
						1005	0.24234				
						1004	0.19839				
						1003	0.34166				
						1002	0.12121				
						1001	0.37476				
						1000	0.2315				
						999	0.43007				
						998	0.19853				
						997	0.25366				
						996	0.23162				
						995	0.28676				
						994	0.24276				
						993	0.25377				
						992	0.29795				
						991	0.11038				
						990	0.25384				
						989	0.19872				
						988	0.14347				
						987	0.22084				
						986	0.36438				
						985	0.13253				
						984	0.27608				
						983	0.22093				
						982	0.29824				
						981	0.30939				
						980	0.27622				
						979	0.25415				
						978	0.24318				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													972	0.647		
													971	0.297		
													970	0.859		
													969	2.069		
													968	2.028		
													967	-0.38		
													966	0.171		
													965	0.196		
													964	0.448		
													963	0.95		
													962	-0.343		
													961	-0.144		
													960	-1.645		
													959	1.067		
													958	1.188		
													957	-0.521		
													956	0.407		
													955	-0.079		
													954	-0.735		
													953	0.1		
													952	0.729		
													951	0.933		
													950	0.294		
													949	0.026		
													948	0.04		
													947	-0.119		
													946	-0.757		
													945	-0.421		
													944	-0.407		
													943	-1.623		
													942	-2.023		
													941	-0.461		
													940	0.862		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								974	-17.905	0.9005				
								973	-16.915	1.8085				
								972	-17.71	1.3595				
								971	-16.925	1.66				
								970	-17.5	1.662				
								969	-18.03	1.814				
								968	-18.58	1.969				
								967	-17.885	1.061				
								966	-16.56	1.369				
								965	-16.56	1.371				
								964	-17.82	1.3725				
								963	-18.19	1.676				
								962	-17.79	1.2215				
								961	-17.79	1.3775				
								960	-17.12	1.379				
								959	-16.48	1.3805				
								958	-16.79	0.917				
								957	-16.79	0.925				
								956	-17.4	1.693				
								955	-17.96	1.695				
								954	-17.605	2.0055				
								953	-17.655	1.3905				
								952	-17.38	1.2365				
								951	-18.585	1.5505				
								950	-18.2	1.2395				
								949	-18.39	1.2405				
								948	-18.88	1.092				
								947	-16.725	1.3975				
								946	-16.725	1.249				
								945	-18.355	1.404				
								944	-18.355	0.7755				
								943	-18.13	1.25				
								942	-18.13	1.0935				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						977	0.2542				
						976	0.24323				
						975	0.27637				
						974	0.30964				
						973	0.28756				
						972	0.24335				
						971	0.28763				
						970	0.18803				
						969	0.30982				
						968	0.22132				
						967	0.40947				
						966	0.15497				
						965	0.23242				
						964	0.23244				
						963	0.26574				
						962	0.27679				
						961	0.21037				
						960	0.28798				
						959	0.24371				
						958	0.26589				
						957	0.21046				
						956	0.19945				
						955	0.2438				
						954	0.24383				
						953	0.3214				
						952	0.19954				
						951	0.34377				
						950	0.22177				
						949	0.26616				
						948	0.27733				
						947	0.29956				
						946	0.19968				
						945	0.22189				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													939	2.129		
													938	0.232		
													937	-0.863		
													936	0.166		
													935	0.966		
													934	1.239		
													933	0.637		
													932	0.295		
													931	0.774		
													930	1.964		
													929	0.935		
													928	-1.055		
													927	0.19		
													926	0.847		
													925	0.915		
													924	-0.715		
													923	-1.07		
													922	0.52		
													921	0.514		
													920	0.971		
													919	0.673		
													918	0.125		
													917	-1.185		
													916	-0.643		
													915	0.713		
													914	0.077		
													913	0.335		
													912	0.009		
													911	2.481		
													910	-0.713		
													909	-0.73		
													908	2.17		
													907	-0.554		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								941	-17.69	1.4115				
								940	-18.19	1.565				
								939	-18.57	1.2565				
								938	-18.57	1.417				
								937	-18.94	1.107				
								936	-18.32	1.261				
								935	-17.89	1.1035				
								934	-17.055	1.737				
								933	-17.355	1.266				
								932	-17.355	1.588				
								931	-17.765	1.43				
								930	-17.28	1.432				
								929	-17.84	1.433				
								928	-17.595	1.4035				
								927	-17.96	1.282				
								926	-18.155	1.278				
								925	-18.595	1.7575				
								924	-18.41	1.572				
								923	-18.145	1.1245				
								922	-18.68	1.4465				
								921	-17.625	1.608				
								920	-18.515	1.4505				
								919	-17.86	2.0975				
								918	-17.23	0.969				
								917	-16.485	1.296				
								916	-16.57	2.106				
								915	-17.535	1.916				
								914	-17.535	1.462				
								913	-17.37	1.951				
								912	-18.1	1.466				
								911	-18.1	1.466				
								910	-18.15	0.9795				
								909	-17.645	1.7975				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						944	0.24411				
						943	0.23309				
						942	0.29972				
						941	0.23315				
						940	0.33304				
						939	0.22205				
						938	0.44418				
						937	0.18885				
						936	0.33321				
						935	0.21111				
						934	0.30001				
						933	0.40002				
						932	0.06667				
						931	0.15558				
						930	0.33343				
						929	0.24454				
						928	0.27798				
						927	0.26684				
						926	0.22238				
						925	0.1891				
						924	0.26692				
						923	0.2892				
						922	0.25591				
						921	0.23369				
						920	0.20027				
						919	0.30051				
						918	0.17806				
						917	0.30057				
						916	0.23381				
						915	0.28956				
						914	0.2116				
						913	0.21162				
						912	0.27846				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													906	-2.017		
													905	0.868		
													904	1.78		
													903	0.127		
													902	1.2		
													901	0.058		
													900	0.416		
													899	-0.331		
													898	-0.178		
													897	0.171		
													896	-0.568		
													895	-1.113		
													894	-0.909		
													893	0.541		
													892	1		
													891	0.463		
													890	-0.453		
													889	-0.049		
													888	-1.098		
													887	-0.833		
													886	1.307		
													885	-0.364		
													884	0.075		
													883	-2.602		
													882	-1.118		
													881	-0.537		
													880	0.315		
													879	0.821		
													878	-0.271		
													877	-1.326		
													876	-0.88		
													875	-0.906		
													874	-2.715		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								908	-17.985	1.4745				
								907	-17.485	1.4765				
								906	-18.26	1.642				
								905	-18.74	1.6455				
								904	-18.055	1.481				
								903	-18.405	1.155				
								902	-18.405	1.654				
								901	-18.725	1.4885				
								900	-18.32	1.16				
								899	-18.31	1.328				
								898	-18.155	1.8285				
								897	-18.17	1.331				
								896	-17.6	1.6645				
								895	-18.045	1.3335				
								894	-18.41	1.002				
								893	-18.61	1.506				
								892	-17.505	2.011				
								891	-17.505	1.6785				
								890	-17.49	1.513				
								889	-17.585	1.851				
								888	-18.58	1.6855				
								887	-18.125	1.0125				
								886	-18.125	1.5215				
								885	-17.02	1.3545				
								884	-17.02	1.1875				
								883	-17.53	1.189				
								882	-17.97	1.5305				
								881	-17.795	1.5335				
								880	-17.825	1.3635				
								879	-17.945	1.1955				
								878	-17.15	1.2				
								877	-17.15	1.2005				
								876	-17.465	1.199				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						911	0.22274				
						910	0.25624				
						909	0.17823				
						908	0.28977				
						907	0.23404				
						906	0.20057				
						905	0.21179				
						904	0.2341				
						903	0.27872				
						902	0.26766				
						901	0.22309				
						900	0.25651				
						899	0.29005				
						898	0.25657				
						897	0.26781				
						896	0.25663				
						895	0.26787				
						894	0.2679				
						893	0.2344				
						892	0.22332				
						891	0.23445				
						890	0.335				
						889	0.34628				
						888	0.17876				
						887	0.18989				
						886	0.26814				
						885	0.21227				
						884	0.23463				
						883	0.257				
						882	0.24591				
						881	0.29064				
						880	0.2572				
						879	0.3243				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													873	-1.291		
													872	1.163		
													871	1.242		
													870	-0.125		
													869	-0.177		
													868	0.359		
													867	0.281		
													866	-0.917		
													865	1.184		
													864	-0.525		
													863	-0.81		
													862	-0.304		
													861	-2.027		
													860	-0.108		
													859	-0.711		
													858	1.709		
													857	-1.148		
													856	0.241		
													855	-0.045		
													854	0.478		
													853	-1.197		
													852	-1.21		
													851	0.233		
													850	-1.341		
													849	-0.708		
													848	-3.187		
													847	-1.576		
													846	-0.552		
													845	-0.72		
													844	0.764		
													843	0.2		
													842	1.688		
													841	1.514		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								875	-17.465	1.717				
								874	-16.99	1.5465				
								873	-16.695	1.0345				
								872	-16.67	1.5535				
								871	-17.195	1.73				
								870	-18.265	1.214				
								869	-18.265	1.216				
								868	-18.475	1.3905				
								867	-18.33	1.3925				
								866	-17.95	1.395				
								865	-18.155	1.57				
								864	-17.345	1.9255				
								863	-17.435	1.3975				
								862	-17.13	1.368				
								861	-17.005	1.228				
								860	-17.005	0.882				
								859	-17.195	1.902				
								858	-16.63	1.238				
								857	-16.86	1.2355				
								856	-17.17	1.417				
								855	-17.905	1.7685				
								854	-18.65	1.7825				
								853	-17.74	1.78				
								852	-17.56	1.601				
								851	-17.56	1.2525				
								850	-17.845	1.079				
								849	-17.73	1.609				
								848	-17.805	1.0765				
								847	-17.805	0.902				
								846	-17.745	0.9035				
								845	-17.81	1.258				
								844	-17.81	1.2675				
								843	-18.345	1.6235				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						878	0.3803				
						877	0.27967				
						876	0.27971				
						875	0.14543				
						874	0.20141				
						873	0.24617				
						872	0.41407				
						871	0.17911				
						870	0.24626				
						869	0.22391				
						868	0.1903				
						867	0.16793				
						866	0.36955				
						865	0.26878				
						864	0.16799				
						863	0.2129				
						862	0.40337				
						861	0.19045				
						860	0.19046				
						859	0.34743				
						858	0.34749				
						857	0.17939				
						856	0.25791				
						855	0.22425				
						854	0.28038				
						853	0.34768				
						852	0.25803				
						851	0.24679				
						850	0.24682				
						849	0.31426				
						848	0.20201				
						847	0.28061				
						846	0.31437				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												840	0.22		
												839	0.851		
												838	0.408		
												837	-1.069		
												836	-1.742		
												835	-0.271		
												834	-1.82		
												833	-1.309		
												832	-1.741		
												831	-2.398		
												830	-0.95		
												829	1.474		
												828	1.021		
												827	-0.565		
												826	-0.727		
												825	-0.079		
												824	-0.657		
												823	-0.665		
												822	0.105		
												821	-1.102		
												820	-0.078		
												819	1.463		
												818	1.079		
												817	1.871		
												816	-0.393		
												815	0.471		
												814	0.243		
												813	-0.857		
												812	-2.057		
												811	-0.77		
												810	-0.188		
												809	0.733		
												808	0.713		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								842	-18.355	1.618				
								841	-18.95	1.4515				
								840	-18.06	1.4625				
								839	-18.06	1.8205				
								838	-18.37	1.4585				
								837	-17.025	1.2735				
								836	-17.11	1.276				
								835	-17.11	2.0105				
								834	-17.625	1.4585				
								833	-18.555	1.659				
								832	-18.685	1.4625				
								831	-18.55	1.2955				
								830	-17.81	1.8465				
								829	-18.4	2.029				
								828	-17.805	1.471				
								827	-17.51	1.8555				
								826	-17.51	1.115				
								825	-16.995	1.489				
								824	-16.995	1.6835				
								823	-16.985	1.6625				
								822	-16.54	1.689				
								821	-16.54	1.136				
								820	-17.78	1.5135				
								819	-17.78	1.5035				
								818	-17.92	1.7005				
								817	-17.725	1.508				
								816	-17.98	1.4965				
								815	-18.675	1.681				
								814	-17.86	1.725				
								813	-16.64	1.503				
								812	-17.41	1.5195				
								811	-17.185	1.507				
								810	-17.185	1.445				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						845	0.30313				
						844	0.28073				
						843	0.28076				
						842	0.24706				
						841	0.20218				
						840	0.21348				
						839	0.25842				
						838	0.2922				
						837	0.19109				
						836	0.37095				
						835	0.28102				
						834	0.19116				
						833	0.23612				
						832	0.2811				
						831	0.19122				
						830	0.21372				
						829	0.32616				
						828	0.28123				
						827	0.22498				
						826	0.23631				
						825	0.29262				
						824	0.30385				
						823	0.23639				
						822	0.28142				
						821	0.23645				
						820	0.28149				
						819	0.27032				
						818	0.31538				
						817	0.34926				
						816	0.29296				
						815	0.27047				
						814	0.22534				
						813	0.25921				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												807	0.081		
												806	0.82		
												805	-0.178		
												804	0.032		
												803	-0.27		
												802	-1.149		
												801	-1.849		
												800	0.929		
												799	1.059		
												798	-0.038		
												797	1.092		
												796	0.243		
												795	0.174		
												794	-0.243		
												793	1.466		
												792	0.897		
												791	1.223		
												790	0.578		
												789	0.745		
												788	-0.321		
												787	0.264		
												786	-0.625		
												785	0.734		
												784	0.182		
												783	-0.229		
												782	0.154		
												781	0.103		
												780	-0.668		
												779	-0.194		
												778	-0.475		
												777	0.039		
												776	-0.459		
												775	0.306		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								809	-17.425	1.209				
								808	-17.07	1.633				
								807	-17.32	1.228				
								806	-17.32	1.094				
								805	-17.295	0.976				
								804	-17.295	1.434				
								803	-17.28	1.444				
								802	-17.005	1.6225				
								801	-17.475	1.424				
								800	-17.475	1.5065				
								799	-17.965	1.7345				
								798	-17.965	1.696				
								797	-17.24	1.3275				
								796	-17.24	1.4565				
								795	-16.77	2.0745				
								794	-17.31	1.379				
								793	-17.31	1.5885				
								792	-17.585	1.7915				
								791	-17.585	1.421				
								790	-17.64	1.6285				
								789	-17.945	1.365				
								788	-18.27	1.5535				
								787	-18.27	1.5555				
								786	-17.18	1.7835				
								785	-17.18	1.786				
								784	-17.95	1.5615				
								783	-17.95	1.521				
								782	-17.82	1.3135				
								781	-18.765	1.378				
								780	-17.79	1.485				
								779	-17.245	1.402				
								778	-17.75	1.5925				
								777	-17.24	1.1955				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						812	0.3043				
						811	0.30434				
						810	0.30438				
						809	0.19173				
						808	0.31578				
						807	0.28195				
						806	0.19179				
						805	0.21436				
						804	0.28203				
						803	0.23696				
						802	0.22565				
						801	0.24823				
						800	0.14668				
						799	0.3273				
						798	0.30478				
						797	0.23711				
						796	0.29362				
						795	0.2484				
						794	0.271				
						793	0.19207				
						792	0.30499				
						791	0.31638				
						790	0.31642				
						789	0.28252				
						788	0.22602				
						787	0.22604				
						786	0.35041				
						785	0.2487				
						784	0.26009				
						783	0.23751				
						782	0.23753				
						781	0.29403				
						780	0.28282				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													774	0.596		
													773	1.519		
													772	0.091		
													771	0.646		
													770	-0.752		
													769	0.678		
													768	0.583		
													767	0.842		
													766	0.609		
													765	0.698		
													764	3.015		
													763	0.746		
													762	0.01		
													761	0.259		
													760	0.636		
													759	1.349		
													758	0.079		
													757	-0.055		
													756	0.523		
													755	1.316		
													754	0.281		
													753	-2.401		
													752	0.691		
													751	-0.369		
													750	-0.539		
													749	-0.701		
													748	-0.008		
													747	0.498		
													746	0.035		
													745	0.581		
													744	-1.771		
													743	0.404		
													742	0.962		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								776	-17.24	1.7005				
								775	-17.455	1.5355				
								774	-17.395	1.263				
								773	-17.395	1.3695				
								772	-16.99	1.2655				
								771	-17.35	1.4145				
								770	-18.285	1.416				
								769	-18.285	1.883				
								768	-17.35	1.7155				
								767	-17.35	2.014				
								766	-17.31	1.931				
								765	-16.72	0.977				
								764	-16.71	1.4455				
								763	-16.71	1.468				
								762	-16.71	1.001				
								761	-17.165	1.6195				
								760	-17.165	1.8985				
								759	-17.855	1.217				
								758	-17.855	1.6665				
								757	-17.355	1.198				
								756	-17.655	1.669				
								755	-17.935	1.927				
								754	-17.935	1.821				
								753	-17.795	1.394				
								752	-17.525	1.9095				
								751	-17.64	1.4375				
								750	-17.64	1.418				
								749	-18.29	1.139				
								748	-18.29	1.5475				
								747	-17.795	0.8825				
								746	-17.795	0.926				
								745	-18.22	1.4215				
								744	-18.22	1.6365				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						779	0.28285				
						778	0.26027				
						777	0.23768				
						776	0.21508				
						775	0.22635				
						774	0.16975				
						773	0.24902				
						772	0.26042				
						771	0.28309				
						770	0.29439				
						769	0.23788				
						768	0.28319				
						767	0.21529				
						766	0.32855				
						765	0.26064				
						764	0.21536				
						763	0.31728				
						762	0.20403				
						761	0.22671				
						760	0.23812				
						759	0.28348				
						758	0.22678				
						757	0.24948				
						756	0.22683				
						755	0.26092				
						754	0.29492				
						753	0.27227				
						752	0.30639				
						751	0.41988				
						750	0.19291				
						749	0.27242				
						748	0.28385				
						747	0.27248				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													741	1.408		
													740	-0.844		
													739	0.43		
													738	0.763		
													737	1.543		
													736	1.291		
													735	1.152		
													734	-1.119		
													733	-0.059		
													732	0.609		
													731	1.288		
													730	-0.48		
													729	0.488		
													728	0.598		
													727	0.784		
													726	1.611		
													725	0.097		
													724	-0.373		
													723	0.432		
													722	-0.257		
													721	1.075		
													720	-0.005		
													719	0.994		
													718	0.57		
													717	-0.277		
													716	-0.344		
													715	0.756		
													714	0.057		
													713	-0.07		
													712	0.365		
													711	-0.849		
													710	-1.336		
													709	-1.147		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								743	-18.58	1.559				
								742	-18.29	0.78				
								741	-18.29	1.562				
								740	-18.31	2.345				
								739	-18.31	1.174				
								738	-18.14	1.175				
								737	-18.14	1.959				
								736	-17.77	1.177				
								735	-17.77	1.57				
								734	-17.77	1.179				
								733	-17.39	1.18				
								732	-17.39	1.968				
								731	-17.41	1.182				
								730	-17.41	1.183				
								729	-17.57	1.184				
								728	-17.57	1.106				
								727	-16.48	1.186				
								726	-16.48	1.583				
								725	-17.35	1.188				
								724	-18.41	1.981				
								723	-18.41	1.19				
								722	-18.41	0.794				
								721	-18	1.589				
								720	-18	0.795				
								719	-17.67	1.592				
								718	-17.67	1.195				
								717	-16.59	0.797				
								716	-16.59	1.596				
								715	-17.54	0.799				
								714	-17.54	1.199				
								713	-18.13	1.2				
								712	-18.13	1.201				
								711	-17.89	0.801				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year	Del 18O permille	Year	PC1 series
					746	0.22711				
					745	0.29525				
					744	0.26128				
					743	0.31803				
					742	0.38634				
					741	0.18183				
					740	0.23869				
					739	0.27274				
					738	0.23875				
					737	0.22735				
					736	0.30698				
					735	0.21598				
					734	0.29563				
					733	0.31841				
					732	0.27297				
					731	0.19335				
					730	0.26171				
					729	0.19339				
					728	0.23901				
					727	0.29586				
					726	0.27315				
					725	0.2391				
					724	0.23912				
					723	0.26191				
					722	0.2505				
					721	0.25053				
					720	0.22779				
					719	0.23925				
					718	0.23928				
					717	0.25064				
					716	0.27344				
					715	0.19368				
					714	0.22793				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													708	-1.469		
													707	-1.378		
													706	-0.329		
													705	0.023		
													704	-2.433		
													703	0.414		
													702	-0.753		
													701	0.027		
													700	1.38		
													699	1.055		
													698	-1.055		
													697	-1.332		
													696	1.092		
													695	0.275		
													694	-0.709		
													693	-0.306		
													692	-0.962		
													691	-0.316		
													690	0.408		
													689	1.164		
													688	0.102		
													687	0.759		
													686	-3.107		
													685	-2.177		
													684	-1.725		
													683	-1.927		
													682	-0.632		
													681	-1.605		
													680	-0.567		
													679	-1.072		
													678	-0.661		
													677	-0.601		
													676	1.172		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								710	-17.89	1.604				
								709	-17.9	0.401				
								708	-17.9	1.205				
								707	-18.56	1.206				
								706	-18.56	1.207				
								705	-18.56	0.805				
								704	-18.01	1.209				
								703	-18.01	1.21				
								702	-17.66	1.211				
								701	-17.66	1.212				
								700	-17.8	1.618				
								699	-17.8	0.809				
								698	-17.31	1.215				
								697	-17.31	1.216				
								696	-18.22	1.217				
								695	-18.76	1.624				
								694	-18.76	1.625				
								693	-17.88	0.813				
								692	-17.88	1.628				
								691	-17.45	1.63				
								690	-17.45	1.631				
								689	-17.45	1.224				
								688	-17.89	1.225				
								687	-17.89	1.635				
								686	-17.52	1.636				
								685	-17.52	0.819				
								684	-17.31	0.819				
								683	-17.31	1.64				
								682	-17.31	0.821				
								681	-17.09	0.821				
								680	-17.09	1.644				
								679	-16.49	1.645				
								678	-16.49	0.823				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						713	0.20517				
						712	0.23943				
						711	0.25079				
						710	0.20523				
						709	0.33068				
						708	0.17103				
						707	0.21675				
						706	0.19397				
						705	0.2624				
						704	0.18255				
						703	0.33088				
						702	0.25103				
						701	0.19407				
						700	0.26254				
						699	0.31968				
						698	0.19414				
						697	0.26263				
						696	0.36545				
						695	0.21704				
						694	0.2399				
						693	0.26276				
						692	0.28563				
						691	0.31998				
						690	0.21717				
						689	0.16002				
						688	0.28587				
						687	0.26293				
						686	0.32016				
						685	0.41176				
						684	0.22882				
						683	0.2517				
						682	0.34331				
						681	0.17167				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													675	0.105		
													674	-0.084		
													673	1.65		
													672	0.882		
													671	-0.871		
													670	0.033		
													669	-0.641		
													668	0.38		
													667	-0.102		
													666	-1.348		
													665	-0.477		
													664	0.078		
													663	-0.65		
													662	-0.381		
													661	0.949		
													660	1.392		
													659	0.95		
													658	-0.422		
													657	-0.085		
													656	0.366		
													655	-0.606		
													654	0.573		
													653	0.99		
													652	-1.505		
													651	-1.159		
													650	0.369		
													649	1.166		
													648	0.988		
													647	-0.374		
													646	-0.747		
													645	-0.323		
													644	-1.065		
													643	0.278		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								677	-16.08	1.648				
								676	-16.08	0.825				
								675	-16.17	0.825				
								674	-16.17	0.826				
								673	-16.26	1.653				
								672	-16.26	1.655				
								671	-16.87	0.828				
								670	-16.87	0.414				
								669	-17.03	1.659				
								668	-17.03	1.245				
								667	-17.03	0.831				
								666	-17.41	1.663				
								665	-17.31	1.248				
								664	-17.31	1.249				
								663	-17.69	1.25				
								662	-17.69	1.167				
								661	-17.04	1.669				
								660	-17.04	1.67				
								659	-16.99	0.836				
								658	-16.99	0.837				
								657	-16.99	1.675				
								656	-17.95	1.257				
								655	-17.95	1.258				
								654	-17.61	1.259				
								653	-17.61	0.84				
								652	-17.32	1.681				
								651	-17.18	1.682				
								650	-17.18	0.842				
								649	-17.78	1.685				
								648	-17.78	1.686				
								647	-18.24	1.266				
								646	-18.24	1.689				
								645	-18.16	0.845				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year	Del 18O permille	Year	PC1 series
					680	0.28615				
					679	0.26331				
					678	0.24047				
					677	0.40077				
					676	0.21754				
					675	0.28633				
					674	0.30926				
					673	0.17183				
					672	0.29793				
					671	0.20627				
					670	0.17189				
					669	0.36684				
					668	0.21785				
					667	0.20636				
					666	0.20638				
					665	0.44726				
					664	0.26378				
					663	0.18354				
					662	0.32129				
					661	0.18358				
					660	0.24095				
					659	0.29834				
					658	0.28697				
					657	0.2181				
					656	0.26409				
					655	0.30999				
					654	0.31003				
					653	0.31006				
					652	0.21822				
					651	0.27577				
					650	0.25273				
					649	0.14944				
					648	0.0919				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													642	0.409		
													641	-0.941		
													640	-3.294		
													639	-0.002		
													638	1.306		
													637	0.179		
													636	-1.14		
													635	0.09		
													634	1.422		
													633	0.347		
													632	-0.496		
													631	-0.916		
													630	-3.217		
													629	-0.586		
													628	0.037		
													627	1.634		
													626	0.958		
													625	-0.244		
													624	0.219		
													623	-1.59		
													622	-1.544		
													621	-1.844		
													620	0.489		
													619	1.63		
													618	0.219		
													617	-0.179		
													616	0.239		
													615	-1.369		
													614	-1.583		
													613	-0.947		
													612	0.825		
													611	-0.636		
													610	-0.04		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								644	-18.16	0.846				
								643	-17.75	1.693				
								642	-17.75	1.271				
								641	-17.32	0.848				
								640	-17.32	1.273				
								639	-17.11	1.274				
								638	-17.11	1.275				
								637	-17.2	0.85				
								636	-17.2	1.277				
								635	-17.18	2.13				
								634	-17.18	1.705				
								633	-18.14	2.559				
								632	-18	1.708				
								631	-18	1.282				
								630	-18	1.283				
								629	-17.29	1.712				
								628	-17.59	1.713				
								627	-17.59	1.286				
								626	-17.34	2.145				
								625	-17.34	0.859				
								624	-17.34	1.718				
								623	-16.95	2.15				
								622	-16.95	0.86				
								621	-17.55	1.722				
								620	-17.77	1.724				
								619	-17.77	1.294				
								618	-17.69	1.726				
								617	-17.9	2.16				
								616	-17.9	1.297				
								615	-17.9	1.731				
								614	-17.28	1.732				
								613	-17.15	2.167				
								612	-17.15	0.867				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						647	0.26432				
						646	0.32179				
						645	0.19539				
						644	0.26439				
						643	0.20696				
						642	0.26444				
						641	0.24151				
						640	0.52916				
						639	0.24158				
						638	0.21863				
						637	0.14961				
						636	0.25318				
						635	0.35679				
						634	0.19573				
						633	0.25326				
						632	0.28782				
						631	0.21877				
						630	0.25333				
						629	0.27635				
						628	0.21883				
						627	0.2534				
						626	0.31099				
						625	0.23046				
						624	0.32261				
						623	0.21894				
						622	0.19596				
						621	0.12683				
						620	0.16141				
						619	0.14985				
						618	0.18444				
						617	0.24205				
						616	0.25364				
						615	0.21907				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
												609	1.51		
												608	-0.443		
												607	-0.964		
												606	-0.463		
												605	-0.535		
												604	0.292		
												603	1.032		
												602	2.689		
												601	0.582		
												600	0.196		
												599	1.148		
												598	0.977		
												597	1.164		
												596	1.381		
												595	1.596		
												594	-0.769		
												593	-1.479		
												592	-1.357		
												591	-1.545		
												590	-1.304		
												589	-0.732		
												588	-1.156		
												587	-0.148		
												586	0.004		
												585	1.482		
												584	-0.413		
												583	0.152		
												582	-0.4		
												581	0.88		
												580	0.714		
												579	-2.333		
												578	-2.957		
												577	-0.687		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								611	-17.15	1.302				
								610	-17.3	0.869				
								609	-17.3	1.304				
								608	-17.25	2.175				
								607	-17.7	1.741				
								606	-17.7	0.871				
								605	-17.33	2.18				
								604	-17.44	1.309				
								603	-17.44	1.747				
								602	-17.4	1.311				
								601	-17.4	0.875				
								600	-17.4	0.876				
								599	-17.28	1.314				
								598	-17.24	1.754				
								597	-17.24	1.229				
								596	-17.82	1.757				
								595	-18.01	1.758				
								594	-18.01	0.88				
								593	-17.12	1.321				
								592	-17.12	1.322				
								591	-16.42	1.323				
								590	-16.42	0.882				
								589	-16.42	0.883				
								588	-16.21	0.884				
								587	-16.21	1.769				
								586	-16.22	0.885				
								585	-16.22	0.886				
								584	-17.19	0.887				
								583	-17.19	1.331				
								582	-17.2	0.888				
								581	-17.2	1.333				
								580	-17.2	0.89				
								579	-17.26	0.89				

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						614	0.23066				
						613	0.23068				
						612	0.2307				
						611	0.23072				
						610	0.23074				
						609	0.23076				
						608	0.23078				
						607	0.2308				
						606	0.23082				
						605	0.23084				
						604	0.23087				
						603	0.23089				
						602	0.23091				
						601	0.23093				
						600	0.23095				
						599	0.23097				
						598	0.23099				
						597	0.23101				
						596	0.23103				
						595	0.23105				
						594	0.23107				
						593	0.23109				
						592	0.23111				
						591	0.23113				
						590	0.23115				
						589	0.23117				
						588	0.23119				
						587	0.23121				
						586	0.23123				
						585	0.23125				
						584	0.23127				
						583	0.2313				
						582	0.23132				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18
													576	0.637		
													575	-0.352		
													574	-0.93		
													573	-0.354		
													572	0.901		
													571	0.288		
													570	0.745		
													569	0.414		
													568	0.633		
													567	-0.501		
													566	-0.945		
													565	-0.039		
													564	1.664		
													563	0.824		
													562	-0.152		
													561	1.121		
													560	2.898		
													559	1.488		
													558	-0.116		
													557	1.093		
													556	-0.012		
													555	0.752		
													554	2.401		
													553	0.86		

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								578	-17.26	1.337				
								577	-17.26	0.892				
								576	-17.42	0.892				
								575	-17.69	0.893				
								574	-17.69	0.894				
								573	-17.69	0.895				
								572	-17.69	0.896				
								571	-17.69	1.344				
								570	-17.69	0.897				
								569	-17.69	0.898				
								568	-17.69	0.898				
								567	-17.69	0.899				
								566	-17.69	0.9				
								565	-17.69	1.351				
								564	-17.69	1.352				
								563	-17.69	1.353				
								562	-17.58	1.354				
								561	-17.58	1.807				
								560	-17.31	1.809				
								559	-17.57	1.358				
								558	-17.57	1.359				
								557	-17.73	1.36				
								556	-17.79	1.361				
								555	-17.79	1.816				
								554	-18.2	0.909				
								553	-18.2	0.91				
								552	-18.08	1.821				
								551	-18.22	1.823				
								550	-18.25	1.824				
								549	-18.25	0.913				
								548	-18.25	0.914				
								547	-17.89	1.829				
								546	-17.29	0.915				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						581	0.23122				
						580	0.23124				
						579	0.23126				
						578	0.23128				
						577	0.2313				
						576	0.23132				
						575	0.23134				
						574	0.23136				
						573	0.23138				
						572	0.23141				
						571	0.23143				
						570	0.23145				
						569	0.23147				
						568	0.23149				
						567	0.23151				
						566	0.23153				
						565	0.23155				
						564	0.23157				
						563	0.23159				
						562	0.23161				
						561	0.23163				
						560	0.23165				
						559	0.23167				
						558	0.23169				
						557	0.23171				
						556	0.23173				
						555	0.23176				
						554	0.23178				
						553	0.2318				
						552	0.23182				
						551	0.23184				
						550	0.23186				
						549	0.23188				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								545	-17.29	1.832				
								544	-16.9	0.917				
								543	-16.9	0.918				
								542	-16.9	0.918				
								541	-17.2	1.838				
								540	-17.32	1.38				
								539	-17.32	1.381				
								538	-17.57	1.382				
								537	-17.57	0.922				
								536	-18.04	1.385				
								535	-18.04	1.386				
								534	-18.3	0.462				
								533	-18.3	0.926				
								532	-18.3	0.927				
								531	-18.19	0.835				
								530	-18.19	0.928				
								529	-17.97	1.394				
								528	-17.97	0.93				
								527	-17.84	0.931				
								526	-17.84	1.397				
								525	-17.98	1.399				
								524	-17.98	1.4				
								523	-17.7	2.335				
								522	-17.88	0.935				
								521	-17.88	1.404				
								520	-18.01	1.873				
								519	-18.01	0.938				
								518	-17.97	1.408				
								517	-17.97	1.409				
								516	-17.52	0.94				
								515	-17.52	0.941				
								514	-17.14	1.413				
								513	-17.14	1.886				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						548	0.31313				
						547	0.22041				
						546	0.26675				
						545	0.22045				
						544	0.24363				
						543	0.27847				
						542	0.2785				
						541	0.23206				
						540	0.22055				
						539	0.18575				
						538	0.31342				
						537	0.27863				
						536	0.19734				
						535	0.29033				
						534	0.29036				
						533	0.10452				
						532	0.17421				
						531	0.23227				
						530	0.22075				
						529	0.22077				
						528	0.19758				
						527	0.18594				
						526	0.20916				
						525	0.26736				
						524	0.372				
						523	0.31385				
						522	0.20925				
						521	0.25581				
						520	0.25584				
						519	0.32564				
						518	0.15122				
						517	0.26758				
						516	0.16292				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								512	-17.28	0.472				
								511	-17.28	0.945				
								510	-17.68	1.418				
								509	-17.68	1.42				
								508	-17.93	1.421				
								507	-17.93	0.948				
								506	-17.93	0.475				
								505	-17.99	1.9				
								504	-17.99	0.951				
								503	-18.21	1.904				
								502	-17.98	1.906				
								501	-17.61	2.861				
								500	-17.34	0.955				
								499	-17.34	0.956				
								498	-17.34	1.435				
								497	-17.22	1.915				
								496	-17.01	1.438				
								495	-17.01	1.439				
								494	-16.63	1.441				
								493	-16.63	0.961				
								492	-16.7	1.444				
								491	-16.7	1.445				
								490	-17.23	0.965				
								489	-17.23	1.448				
								488	-17.87	1.45				
								487	-17.87	0				
								486	-18.16	0				
								485	-18.16	0				
								484	-17.97	0				
								483	-17.97	0				
								482	-18.02	0				
								481	-17.76	0				
								480	-17.76	0				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year	Del 18O permille	Year	PC1 series
					515	0.16293				
					514	0.27932				
					513	0.27935				
					512	0.27938				
					511	0.20958				
					510	0.19792				
					509	0.10474				
					508	0.13966				
					507	0.2678				
					506	0.22122				
					505	0.20967				
					504	0.26787				
					503	0.25633				
					502	0.19804				
					501	0.12818				
					500	0.27964				
					499	0.20978				
					498	0.26801				
					497	0.15148				
					496	0.43127				
					495	0.11656				
					494	0.25653				
					493	0.27983				
					492	0.27986				
					491	0.24491				
					490	0.29161				
					489	0.18658				
					488	0.24498				
					487	0.18661				
					486	0.28001				
					485	0.21005				
					484	0.15167				
					483	0.25679				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18
								479	-17.76	0				
								478	-17.47	0				
								477	-17.49	0				
								476	-17.49	0				
								475	-17.77	0				
								474	-17.77	0				
								473	-17.77	0				
								472	-18.49	0				
								471	-18.49	0				
								470	-18.49	0				

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year	Del 18O permille	Year	PC1 series
					482	0.2334				
					481	0.39686				
					480	0.25687				
					479	0.18676				
					478	0.25692				
					477	0.31527				
					476	0.26857				
					475	0.29203				
					474	0.28034				
					473	0.2103				
					472	0.29211				
					471	0.21034				
					470	0.33894				
					469	0.24544				
					468	0.23374				
					467	0.24548				
					466	0.24551				
					465	0.25726				
					464	0.30396				
					463	0.22212				
					462	0.22214				
					461	0.23389				
					460	0.21057				
					459	0.26901				
					458	0.28078				
					457	0.32763				
					456	0.23401				
					455	0.21067				
					454	0.22231				
					453	0.26917				
					452	0.22235				
					451	0.29259				
					450	0.23414				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						449	0.25753				
						448	0.23419				
						447	0.29271				
						446	0.24586				
						445	0.17563				
						444	0.2459				
						443	0.21079				
						442	0.24595				
						441	0.16405				
						440	0.30464				
						439	0.24601				
						438	0.21089				
						437	0.16399				
						436	0.25783				
						435	0.36334				
						434	0.21097				
						433	0.26967				
						432	0.23441				
						431	0.3049				
						430	0.24623				
						429	0.24625				
						428	0.23451				
						427	0.2463				
						426	0.24632				
						425	0.21115				
						424	0.18774				
						423	0.26981				
						422	0.2112				
						421	0.31684				
						420	0.34032				
						419	0.11741				
						418	0.18784				
						417	0.10564				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						416	0.29353				
						415	0.24655				
						414	0.28181				
						413	0.30529				
						412	0.18795				
						411	0.15272				
						410	0.32894				
						409	0.29373				
						408	0.23494				
						407	0.23496				
						406	0.23498				
						405	0.235				
						404	0.23502				
						403	0.23504				
						402	0.23506				
						401	0.23508				
						400	0.23511				
						399	0.23513				
						398	0.23515				
						397	0.23517				
						396	0.23519				
						395	0.23521				
						394	0.23523				
						393	0.23525				
						392	0.23527				
						391	0.2353				
						390	0.23532				
						389	0.23534				
						388	0.27067				
						387	0.32964				
						386	0.23541				
						385	0.29439				
						384	0.23546				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years		Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland	Del 18O permille	Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Year	Model ice Equiv Accumulation, g cm-2 yr-1	Year		Year	PC1 series
					383	0.30615				
					382	0.318				
					381	0.15316				
					380	0.21203				
					379	0.24739				
					378	0.24742				
					377	0.24744				
					376	0.24746				
					375	0.24749				
					374	0.24751				
					373	0.24753				
					372	0.24756				
					371	0.24758				
					370	0.24761				
					369	0.24763				
					368	0.24765				
					367	0.24768				
					366	0.2477				
					365	0.24772				
					364	0.18879				
					363	0.35396				
					362	0.22424				
					361	0.22426				
					360	0.28325				
					359	0.27144				
					358	0.15349				
					357	0.12981				
					356	0.25977				
					355	0.18895				
					354	0.23611				
					353	0.11812				
					352	0.27158				
					351	0.27161				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						350	0.28349				
						349	0.23622				
						348	0.2954				
						347	0.20082				
						346	0.26				
						345	0.27177				
						344	0.2482				
						343	0.2009				
						342	0.31917				
						341	0.14186				
						340	0.1064				
						339	0.17735				
						338	0.27204				
						337	0.27207				
						336	0.28385				
						335	0.31937				
						334	0.28391				
						333	0.30769				
						332	0.20122				
						331	0.23674				
						330	0.26039				
						329	0.26042				
						328	0.27232				
						327	0.24859				
						326	0.22498				
						325	0.24864				
						324	0.26054				
						323	0.17763				
						322	0.10658				
						321	0.2606				
						320	0.24874				
						319	0.26065				
						318	0.21324				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						317	0.28447				
						316	0.22517				
						315	0.2963				
						314	0.249				
						313	0.28459				
						312	0.27273				
						311	0.22529				
						310	0.16606				
						309	0.16607				
						308	0.20166				
						307	0.26093				
						306	0.2136				
						305	0.2373				
						304	0.21363				
						303	0.21365				
						302	0.27295				
						301	0.21369				
						300	0.2374				
						299	0.17812				
						298	0.26114				
						297	0.18994				
						296	0.18996				
						295	0.27311				
						294	0.18999				
						293	0.22563				
						292	0.20194				
						291	0.24949				
						290	0.29707				
						289	0.23763				
						288	0.26149				
						287	0.21395				
						286	0.29718				
						285	0.2258				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						284	0.23774				
						283	0.24969				
						282	0.27345				
						281	0.23781				
						280	0.23783				
						279	0.24978				
						278	0.26174				
						277	0.24983				
						276	0.2736				
						275	0.23795				
						274	0.22615				
						273	0.2023				
						272	0.32134				
						271	0.28568				
						270	0.26195				
						269	0.20238				
						268	0.19046				
						267	0.17865				
						266	0.16672				
						265	0.23816				
						264	0.23818				
						263	0.2382				
						262	0.22639				
						261	0.22641				
						260	0.26216				
						259	0.26219				
						258	0.26222				
						257	0.25029				
						256	0.25031				
						255	0.22654				
						254	0.1192				
						253	0.1907				
						252	0.22659				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						251	0.25041				
						250	0.21467				
						249	0.28622				
						248	0.17895				
						247	0.27431				
						246	0.26249				
						245	0.22674				
						244	0.32214				
						243	0.21482				
						242	0.23865				
						241	0.21485				
						240	0.25067				
						239	0.22687				
						238	0.20294				
						237	0.27456				
						236	0.27459				
						235	0.22695				
						234	0.22697				
						233	0.23885				
						232	0.21503				
						231	0.23889				
						230	0.21507				
						229	0.29874				
						228	0.2271				
						227	0.26296				
						226	0.251				
						225	0.26302				
						224	0.28691				
						223	0.25109				
						222	0.19127				
						221	0.10757				
						220	0.25115				
						219	0.17944				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						218	0.25119				
						217	0.26321				
						216	0.22725				
						215	0.16751				
						214	0.13164				
						213	0.20341				
						212	0.23932				
						211	0.26335				
						210	0.32317				
						209	0.25141				
						208	0.32325				
						207	0.23946				
						206	0.28741				
						205	0.2156				
						204	0.27545				
						203	0.25157				
						202	0.2516				
						201	0.21569				
						200	0.26367				
						199	0.15576				
						198	0.14375				
						197	0.17982				
						196	0.25173				
						195	0.2158				
						194	0.27571				
						193	0.27574				
						192	0.19182				
						191	0.21589				
						190	0.19185				
						189	0.26381				
						188	0.17997				
						187	0.22788				
						186	0.2279				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						185	0.20397				
						184	0.22794				
						183	0.14395				
						182	0.17995				
						181	0.28807				
						180	0.24006				
						179	0.21612				
						178	0.13209				
						177	0.19207				
						176	0.26411				
						175	0.10803				
						174	0.19211				
						173	0.20417				
						172	0.28829				
						171	0.15614				
						170	0.21628				
						169	0.09615				
						168	0.40855				
						167	0.22828				
						166	0.25241				
						165	0.20433				
						164	0.25246				
						163	0.26442				
						162	0.21645				
						161	0.25253				
						160	0.2405				
						159	0.32473				
						158	0.26457				
						157	0.31274				
						156	0.21648				
						155	0.24063				
						154	0.20457				
						153	0.27677				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						152	0.22863				
						151	0.20463				
						150	0.30089				
						149	0.2287				
						148	0.18054				
						147	0.16859				
						146	0.18056				
						145	0.30102				
						144	0.25285				
						143	0.27704				
						142	0.18064				
						141	0.24096				
						140	0.32535				
						139	0.26507				
						138	0.24104				
						137	0.26513				
						136	0.27725				
						135	0.24112				
						134	0.27731				
						133	0.22908				
						132	0.2291				
						131	0.20504				
						130	0.2894				
						129	0.26535				
						128	0.34986				
						127	0.31371				
						126	0.26545				
						125	0.20519				
						124	0.2534				
						123	0.22932				
						122	0.24146				
						121	0.25347				
						120	0.18107				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						119	0.27775				
						118	0.28977				
						117	0.21735				
						116	0.20537				
						115	0.20539				
						114	0.19329				
						113	0.25366				
						112	0.21745				
						111	0.31421				
						110	0.29				
						109	0.24177				
						108	0.20554				
						107	0.24182				
						106	0.20558				
						105	0.25387				
						104	0.20561				
						103	0.26605				
						102	0.21767				
						101	0.22982				
						100	0.24198				
						99	0.29032				
						98	0.24203				
						97	0.22992				
						96	0.24208				
						95	0.32675				
						94	0.23				
						93	0.25419				
						92	0.23004				
						91	0.21792				
						90	0.21794				
						89	0.23011				
						88	0.09683				
						87	0.16962				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
	% MELT-NORMALIZED DEPARTURES		% MELT-NORMALIZED DEPARTURES												
MGNORM.1yr		pcnorm-5.all		YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China		Thompson et al., 2003:Dasuopu, W. China		Thompson et al., 2003:Huascaran, Peru		Thompson et al., 2003: Sajama, Bolivia		Thompson et al., 2002:Kilimanjaro		Fisher, D.A.., 2002 - James Ross		Fisher D.A., 2002 - Law Dome, Antarctica		Fisher, D.A., 2002 - Dolleman Antarctica		Fisher, D.A., 2002 - Dyer Plateau, Antarctica		Fisher, D.A., 2002 - Plateau		Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	End year of 10 yr period	O-18	jross210.ant	O-18	lawa210.ant	O-18	doll210.ant	O-18	dyer210.ant	O-18	plato210.ant	O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						86	0.27864				
						85	0.25437				
						84	0.19386				
						83	0.26657				
						82	0.24241				
						81	0.38786				
						80	0.30303				
						79	0.2425				
						78	0.20616				
						77	0.27892				
						76	0.21824				
						75	0.26681				
						74	0.25467				
						73	0.20626				
						72	0.2305				
						71	0.26692				
						70	0.24272				
						69	0.24274				
						68	0.29135				
						67	0.27921				
						66	0.23065				
						65	0.29145				
						64	0.2793				
						63	0.29152				
						62	0.34005				
						61	0.43736				
						60	0.21864				
						59	0.25523				
						58	0.20661				
						57	0.23089				
						56	0.23091				
						55	0.25533				
						54	0.23096				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						53	0.29185				
						52	0.15807				
						51	0.24323				
						50	0.21897				
						49	0.31624				
						48	0.20682				
						47	0.27982				
						46	0.27985				
						45	0.27988				
						44	0.27991				
						43	0.27995				
						42	0.27998				
						41	0.28001				
						40	0.32878				
						39	0.24356				
						38	0.28011				
						37	0.31668				
						36	0.26796				
						35	0.3533				
						34	0.23148				
						33	0.18285				
						32	0.19497				
						31	0.28033				
						30	0.20724				
						29	0.18292				
						28	0.29263				
						27	0.18296				
						26	0.29269				
						25	0.26838				
						24	0.26841				
						23	0.2562				
						22	0.24399				
						21	0.30509				

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Fisher & Koerner 1995 - Agassiz Ice Cap		Fisher & Koerner 1994 - Agassiz Ice Cap		Tarrussov 1992			Fisher, D.A., 2003 - N. Greenland		Fisher, D.A., 2002 - Devon Ice Cap	Fisher, D. A., 2003 - Devon Ice Cap		Fisher, D.A., 2002 -C. Greenland (GISP2,GRIP)		Fisher, D.A., 2003 - Penny Ice Cap, Baffin Island	
MGNORM.1yr	% MELT-NORMALIZED DEPARTURES	pcnorm-5.all	% MELT-NORMALIZED DEPARTURES	YEAR	% melt: H(	% melt: H(	mean % M	delnort3.stk	O-18	bld-1.dev	pc5bld.dev	% melt	delnorm6.cwg	O-18	Pennydel.p95	O-18

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Fisher et al., 1999 - Penny Ice Cap, Baffin Island		Fisher et al., 1998 - Penny Ice Cap, Baffin Island	Fisher, D.A., 2002 - S. Greenland	Fisher, D.A., 2004 - S. Greenland	Holdsworth et al., 1992 & 1993 - Mt Logan Canada			Thompson et al., 1992 - Quelccaya, Peru			Thompson et al., 2003:Quelccaya, Peru		Thompson et al., 2003: Dunde, China	
pc1yr2		pc25yrsp	sgreenpc	del1dye2	Year	Accum (m)	Delta 18O (per mil)	Thermal Year	O18	Accumulation (m)	End year of 10 yr period	O-18	End year of 10 yr period	O-18

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Thompson et al., 2003: Guliya, W. China	Thompson et al., 2003:Dasuopu, W. China	Thompson et al., 2003:Huascaran, Peru	Thompson et al., 2003: Sajama, Bolivia	Thompson et al., 2002:Kilimanjaro	Fisher, D. A.., 2002 - James Ross	Fisher D.A., 2002 - Law Dome, Antarctica	Fisher, D. A., 2002 - Dolleman Antarctica	Fisher, D.A., 2002 - Dyer Plateau, Antarctica	Fisher, D.A., 2002 - Plateau	Stenni, B., et al., 1999 - Talos Dome Antarctica
End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	End year of 10 yr period O-18	jross210.ant O-18	lawa210.ant O-18	doll210.ant O-18	dyer210.ant O-18	plato210.ant O-18	Years A.D.

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delta D mean annual	Fisher, D.A.., 2002 - Siple Dome, Antarctica		Ekaykin et al, in press - Vostok 200 yrs data - Both series are smoothed with a period of 11 years			Meese et al., 1994 (revised): GIS		NGRIP 2004 - 50 year means - N. Greenland		Vinther et al, 2001: South-Central Greenland ice cores-based PC/NAO index	
	siple210.ant	O-18	Year	dD, per mil	Accumulation, g cm-2 yr-1	Year	Model ice Equiv	Year	Del 18O permille	Year	PC1 series
						20	0.24405				
						19	0.26856				
						18	0.21974				
						17	0.24412				
						16	0.24415				
						15	0.2198				
						14	0.31756				
						13	0.28086				
						12	0.24426				
						11	0.20765				
						10	0.21992				
						9	0.32986				
						8	0.19546				
						7	0.20773				
						6	0.22001				
						5	0.22003				
						4	0.22005				
						3	0.29339				
						2	0.3301				
						1	0.318				

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Author	description (red if used in Mann et al 98)	sample interval (years)	Data type	site id / chronid	latitude	longitude	elevation	start year	end year	instrumental correlations	use for high frequency?	use for low frequency?	is it public?
Fisher & Koerner 1995	Agassiz Ice Cap, Ellesmere Is., N. Canac	1	8001		80.75	-72.83	1670						
Fisher & Koerner 1994	Agassiz Ice Cap, Ellesmere Is., N. Canac	1 and 5	8004		80.75	-72.83	1670	617	1961		no	yes	no
Tarusov, 1992	Svalbard	2 to 20	8004	hole 85 & 87	78	20		-575	1985		no	yes	no
Fisher, D.A., 2003	N. Greenland	1	8001		75.9	-47.7		1761	1972				no
Fisher, D.A., 2002	Devon Island Ice Cap, N. Canada	1	8001		75.42	-82.5	1800	1512	1973				no
Fisher, D.A., 2003	Devon Island Ice Cap, N. Canada	5	8004		75.42	-82.5	1800	1161	1971		no	yes	no
Fisher, D.A., 1996	C. Greenland (GISP2/GRIP)	1	8001		71.26	-37.7	3200	553	1982		yes	yes	no
Fisher, D.A., 1998	Penny Ice Cap, Baffin Is., Canada	1	8001		67.25	-65.5	1900	1761	1970				no
Fisher et al., 1999	Penny Ice Cap, Baffin Is., Canada	1	8004		67.25	-65.5	1900	1694	1992		yes	yes	no
Fisher et al., 1998	Penny Ice Cap, Baffin Is., Canada	25	8004		67.25	-65.5	1900	1790	1992		no	yes	no
Kameda et al., 1996	S. Greenland	1	8004		66.87	-46.27		1761	1970				no
Fisher, D.A., 2004	S. Greenland	1	8001		66.48	-46.33		1742	1974				no
Holdsworth et al., 1992	Mt Logan, Alaska	1	8001		60.6	-140.5	5340	1736	1987				yes
Holdsworth et al., 1993	Mt Logan, Alaska	1	8003		60.6	-140.5	5340	1736	2000				yes
Thompson, L. G., E. Mosley-Thompson, .	Quelccaya, Peru	1	8001	Core 1 & summ	-13.93	-70.83	5670	470	1984				yes
Thompson, L. G., E. Mosley-Thompson, .	Quelccaya, Peru	1	8003	Core 1 & Summ	-13.93	-70.83	5670	470	1984				yes
Thompson, L. G., E. Mosley-Thompson, .	Quelccaya, Peru	10	8001		-13.93	-70.83	5670	1001	2000				yes
Lin, P.N., L.G. Thompson, M.E. Davis an	Dunde, W. China	10	8001		38.1	96.4	5325	1001	1987				no
Thompson, L.G., E. Mosley-Thompson, M	Guliya, W. China	10	8001		35.28	81.5	6710	1000	1989				no
Thompson, L.G., T. Yao, E. Mosley-T	Dasuopu, W. China	10	8001		28	85	6900	1001	1997				no
Thompson, L.G., E. Mosley-Thompson, M	Huascaran, Peru	10	8001		-9.11	-77.6	6048	1001	1995				no
Thompson, L.G., M.E. Davis, E. Mos	Sajama, Bolivia	10	8001		-18	-68	6,548	1001	1997				no
Thompson, L. G., E. Mosley-Thompson, '	Kilimanjaro, Tanzania	10	8001	KNIF 2 & 3	-3.08	37.3	5893	460	1950			yes	yes
Fisher, D.A., 2002	James Ross	1	8001		-64.22	-57.68		1791	2000				no
Fisher, D.A., 2002	Law Dome, Antarctica	1	8001		-66.1	111	1390	1761	1970				no
Fisher, D.A., 2002	Dolleman, Antarctica	1	8001		-70.58	-60.93		1761	1970				no
Fisher, D.A., 2002	Dyer Plateau, Antarctica	1	8001		-70.67	-64.87		1761	1970				no
Fisher, D.A., 2002	Plateau	1	8001		-84	43		1761	1970				no
Stenni, B., et al., 2002	Talos Dome, Antarctica	1	8002		-72.8	159.1	89	1217	1996				yes
Fisher, D.A., 2002	Siple Dome, Antarctica	Jan-00	8001		-81.65	-148.81	650	1761	1970				no
Ekaykin et al, in press	Vostok, Antarctica	1	8001 & 8003		-78.5	106.8	3421	1779	1994		no	yes	no

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Meese et al, 1994	GISP2, Greenland	1	8003	72.6	-38.5	3200	1	1988	no	yes	no
NGRIP members 2004	NGRIP	50	8001	75	-42	2975	0	2000	no	yes	yes
Vinther et al, 2003	S. & C. Greenland	1	8006	7 cores (PC)	66.48	-46.33	1245	1970			yes

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do we have it?	location in database		notes
	Fisher 2004 CD (pers. comm): file MGNORM.1YR		each core series normalised then AVERAGED; cores A79, A84 A87
yes	Fisher 2004 CD (pers. comm): file PCNORM-5.ALL		each core series normalised then AVERAGED; cores A84 A87 A77 A79
yes	Fisher 2004 CD (pers. comm): Tarussov data set; file SVALBARD		Data digitized; hole 85 spans 1574-1936, & hole 85 spans -575-1985…mean thus available only for 1574-1936; data irreg. Spaced but mostly ~2 yr for last 1500yr
yes	Fisher, D.A., 2002. CD 2004 (pers. comm.) file DELNORT3.STK		stack of 3 cores,. Normalized then averaged.
yes	Fisher 2004 CD (pers. comm): file BLD-1.DEV		
yes	Fisher 2004 CD (pers. comm): file PC5BLD.DEV		Average of 3 cores: 1971, 72, 73
yes	Fisher, D.A., 2002. CD 2004 (pers. comm.) file DELNORM6.CWG		285 years; stack of 13 series, normalized; claims zero time error (volcanic signal synchronized for timescale)
yes	Fisher 2004 CD (pers. comm): file PENNYDEL.P95		
yes	Fisher 2004 CD (pers. comm): file Penny 95.4 core/ice layers/ PC1YR2		
yes	Fisher 2004 CD (pers. comm): file PC25YRSP		
yes	Fisher 2004 CD (pers. comm): Kameda data set; file SGREENPC		Kameda et al., 1996
yes	Fisher, D.A., 2002. CD 2004 (pers. comm.) file DEL1DYE2.DYE		
yes	Moore et al., 2002; IGBP Pages/WDC-A for Paleoclimatology Contribution Series # 2002-79		
yes	Moore et al., 2002; IGBP Pages/WDC-A for Paleoclimatology Contribution Series # 2002-81		1988 missing
yes	Thompson, 1992; IGBP PAGES/World Data Center-A for Paleoclimatology Data Contribution Series # 92-008	ftp://ftp.ngdc.noaa.gov/paleo/icecore/trop/quelccaya/q83cor1.txt	Mean of 2 cores back to AD 744 (Core 1 extends to AD470; summit to AD744)
yes	Thompson, 1992; IGBP PAGES/World Data Center-A for Paleoclimatology Data Contribution Series # 92-008	ftp://ftp.ngdc.noaa.gov/paleo/icecore/trop/quelccaya/q83cor1.txt	Mean of 2 cores back to AD 744 (Core 1 extends to AD470; summit to AD744)
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann	10 year means 1001-1010 to 1991-2000	
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann		
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann		
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann		
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann		
yes	juniper/data sets/ice core data/6 ice-core-composite-for-Bradley-Jones-Mann		
yes	juniper/data sets/ice core data/kibo isotopes last 2ka	mean of 2 NIF sites	
yes	Fisher 2004 CD (pers. comm): file JROSS210.ANT		
yes	Fisher 2004 CD (pers. comm): file LAWA210.ANT		
yes	Fisher 2004 CD (pers. comm): file DOLL210.ANT		
yes	Fisher 2004 CD (pers. comm): file DYER210.ANT		
yes	Fisher 2004 CD (pers. comm): file PLATO210.ANT		
yes	Stenni, B., et al., 2002; IGBP Pages/WDC-A for Paleoclimatology Contribution Series # 2002-68		
yes	Fisher 2004 CD (pers. comm): file SIPLE210.ANT		
yes	Vostok 200 yrs data.xls		

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		Deb Meese; Pers. comm.9/6/04: data available back through Holocene--only last ~2000 years shown here; "It's based on the depth age scale which incorporated del 18O and is the accum model that Bolzan, Waddington, etc put together"
yes	Juniper1: data sets/ice cores/GISPage+accum.xls	Data avaialable back to 12,950 BP, but not included here.
yes	http://www.glaciology.gfy.ku.dk/index_e.html	In Vinther et al [GRL vol. 30, no. 1387, doi:10.1029/2002GL016193, 2003.] this is the PC1 time series, based on winter delta-O18 data from 7 Greenland ice cores (Crete, Dye3-71, Dye3-79, GRIP 89-1, GRIP 93,Milcent, Renland). winters are dated according to the month of January; series mean =0, SD=1
yes	http://www.glaciology.gfy.ku.dk/index_e.html	

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KEY to COLUMN E

Ice	8001 = O-18
	8002 = deuterium
	8003 = accumulation
	8004 = melt %
	8005 = other (dust, gases etc)
	8006= derived parameter (PC, or other index)

Mann et al 1998 used:

Greenland	Ice melt	summer air temp	66N	45W	1545	Kameda et al, 1996
Svalbard	Ice melt	summer air temp	79N	17W	1400	Tarussov 1992
Penny	Ice O-18	(temp)	70N	70W	1718	Fisher et al 1998
Central Greenland (Stack)	Ice O-18	(temp)	77N	60W	553	Fisher et al 1996
Quelccaya summit core	Ice O-18	(air temp)	14S	71W	470	Thompson 1982
Quelccaya summit core	Ice accumulation	precip	"	"	488	"
Quelccaya Core 2	Ice O-18	(air temp)	"	"	744	"
Quelccaya Core 2	Ice accumulation	precip	"	"	744	"

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From: raymond s. bradley
To: srutherford@rwu.edu; mann@multiproxy.evsc.virginia.edu; zz9t@virginia.edu; mhughes@ltrr.arizona.edu
Cc: tcook@geo.umass.edu
Subject: Coral data inventory
Date: Monday, January 24, 2005 12:35:28 PM
Attachments: CORAL inventory 2005.xls

I attach the latest inventory of coral data; the data itself is found on sheet 2 of the file. This provides a significant improvement over Mann et al 1998, though the records are generally short. Note too that some are sub-annual, some are annual and some are multi-annual in resolution, and there are cautionary notes in the last column.
If you have any questions, let me know. This supercedes any earlier versions of these data you may have received.

I am working on the other proxies (sediments, speleothems, historical & ice core data) and will send similar file to you soon. If you see problems in the way this version is formatted, let me know so I can perhaps amend other versions.
Ray

Raymond S. Bradley
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<http://www.paleoclimate.org>
Paleoclimatology Book Web Site: http://www.geo.umass.edu/climate/paleo/html
Publications (download .pdf files):
http://www.geo.umass.edu/faculty/bradley/bradleypub.html

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In Databas	Author	description (red if	sample interval (years)	Data type	site id/chro nid	latitude North= +	longitude: East=+	species	elevation	sample depth	start year	end year	instrumental correlat	use for high frequen	use for low frequen	is it public?	do we have it?	location in databas	Readme file--data	notes
yes	Lough, J. &	Great Barr	1; 5 yr gau	7004		-18	147.2	*Porites*			1746	1982		no	yes	no	yes	Lough and	ftp://ftp.ngc	Use 5 yr gaussian. Alt
yes	Heiss, 199	**Aquaba, J**	1	7001		29.4	35	*Porites sp.*	-1		1788	1992		yes		yes	yes	Heiss (199	ftp://ftp.ngc	**no statistically signit**
yes	Felis et al.	Ras Umm,	0.167	7001		27.8	34.3	*Porites sp.*	-5.5		1751	1995		no		yes	yes	Felis et al.	ftp://ftp.ngc	**generally (-) relations**
yes	Haase-Sch	Montego B	var: 2 to 6	7001		18.5	-77.9	*Ceratopor*	-20		1344	1991		no		yes	yes	Haase-Sch	ftp://ftp.ngc	**sclerosponges (Cerato**
yes	Haase-Sch	Montego B	var: 2 to 6	7003		18.5	-77.9	*Ceratoporella nicholsoni*			1356	1991		yes		yes	yes	Haase-Sch	ftp://ftp.ngc	**sclerosponges (Cerato**
yes	Linsley, et	Secas Is, E	0.125 to 0.	7001		7.9	-82	*Porites lobata*			1708	1983		yes		yes	yes	Linsley et a	ftp://ftp.ngc	core gap between 200
yes	Urban et a	Maiana Ato	0.167	7001		1	173	*Porites sp*			1840	1993		yes		yes	yes	Urban et a	ftp://ftp.ngc	**good, generally cons**
yes	Dunbar et	**Urvina,Ga**	1	7001		0.4	-91.2	*Pavona cla*	0		1607	1953		yes		yes	yes	Dunbar et	ftp://ftp.ngc	**good, generally cons**
yes	Cole et al.,	Malindi, Ke	1	7001		-3	40	*Porites lute*	-6		1801	1994		yes		yes	yes	Cole et al.	ftp://ftp.ngc	**(-) relationship with S**
yes	Charles et	Seychelles	0.083	7001		-4.6	55.8	*Porites lute*	-7		1847	1994		yes		yes	yes	Charles et	ftp://ftp.ngc	**generally consistent**
yes	Quinn et al	**Espiritu S**	1:mean of	7001		-15	167	*Platygyra lamellina*			1807	1979		yes		yes	yes	Quinn et al	ftp://ftp.ngc	**no statistically signit**
yes	Isdale, P.J	**Havannah**	1*	7005		-18.85	146.55	*Porites sp*			1644	1870		yes		yes	yes	Isdale, P.J	ftp://ftp.ngc	*Burdekin River runoff
yes	McCulloch	Havannah	1*	7003		-18.85	146.55	*Porites sp*			1758	1870		yes		yes	yes	McCulloch	ftp://ftp.ngc	*Burdekin River runoff
yes	Linsley et a	Raratonga	0.08	7003		-21.2	-159.8	*Porites lute*	-18.3		1727	1996		yes		yes	yes	Linsley et a	ftp://ftp.ngc	**generally (-) relations**
yes	Quinn et al	**Amedee,N**	0.5	7001		-22.5	166.5	*Porites sp*	-3		1658	1992		yes		yes	yes	Quinn et al	ftp://ftp.ngc	**generally (-) relations**
yes	Kuhnert, H	Houtman A	0.16	7001		-28.5	113.8	*Porites lute*	-5		1795	1993		yes		yes	yes	Kuhnert, H	ftp://ftp.ngc	**generally (-) relations**
yes	Zinke et al	Indian Oce	0.16	7001,2,3		-23.15	43.58	*Porites lob*	-1.1		1659	1995		yes		yes	yes	Zinke et al	ftp://ftp.ngc	**Sr/Ca data discontin**
no	*Linsley et a*	*Vanua Levi, Fiji, SW F*		*7003*		*-16.82*	*179.23*	*Porites lute*	*-10*		*1780*	*1997*					*not yet!*			*Willing to provide data*
no	*Linsley et a*	*Vanua Levi, Fiji, SW F*		*7001*		*-16.82*	*179.23*	*Porites lute*	*-10*		*1780*	*1997*								*Willing to provide data*

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		Main Signal (Lough					
hough there is a significant relationship with average SSTs the explained variance is low although it is slightly better for the 5-year gaussian filtered series but still <30%. This 10-coral average series would be the one to use ra							
f relationship with SSTs, SOI or Use core 18 data set							
ship to SSTs		PDO	ENSO	NAO	SST	salinity	rainfall
pporella nicholsoni)							
pporella nicholsoni)							
)9 and 2010 mm, with **no statistically signif relationship with SSTs, SOI or rainfall**							
sistent (+) 1901-05 patched from Tarawa "through straightforward comparisor		SST	rainfall	ENSO			
sistent (+) relationship with SOI; P. Clavus produces aragonite about 0.40 p		SST	ENSO				
SSTs 1961-90 only							
(-) relationship with SSTs, + with SOI		SST					
f relationship with SS Mean of 4 samples year used -revised from QSR paper							
Oct-Sept discharge year; anthropogenic influence after AD1870							
Oct-Sept discharge year; after ~1870, anthropgenic disturbance dominates signal; chronology checked with known floods in 1819, 1826, 1831, 1859, 1860 and 1864							
ship to SSTs & SOI		SST	PDO				
ship to SSTs & SOI	Use file "NC.Published.1992-1657.Qtr.txt"	SST					
ship to SSTs & SOI, but mostly not signif. Errors are estimated to be ±1 year per 100 years (due to unclear banding and d18O cycles near 1853 and 1869, respectively)							
uous							
in 2005							
in 2006							

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1982	-0.61	-0.29	1992	-3.16	0.05	1995.583	-4.12	1991	-0.91	1991	9.525	0.068	1984.5	-0.72	-6.12	1840	-4.69144	1981	-4.13	1994	-4.705	1995.13
1981	0.17	-0.06	1991	-2.98	0.03	1995.417	-3.82	1986	-0.79	1986	9.494	0.072	1984.44	-0.23	-5.85	1840.17	-4.78337	1980	-4.26	1993	-4.658	1995.04
1980	0.07	-0.02	1990	-2.72	0.02	1995.25	-3.05	1982	-0.88	1982	9.52	0.053	1984.38	-0.64	-5.91	1840.33	-4.5927	1979	-4.44	1992	-4.664	1994.96
1979	-0.28	-0.18	1989	-2.74	0.03	1995.083	-3.02	1976	-0.82	1975	9.54	0.034	1984.33	-0.75	-5.72	1840.5	-4.36152	1978	-4.15	1991	-4.627	1994.88
1978	-0.30	-0.20	1988	-2.63	0.02	1994.917	-3.62	1971	-0.72	1971	9.518	0.051	1984.27	-0.85	-6.18	1840.67	-4.31497	1977	-4.26	1990	-4.598	1994.79
1977	-0.02	-0.01	1987	-2.93	0.05	1994.75	-3.96	1967	-0.77	1971	9.431	0.044	1984.21	-0.93	-6.27	1840.83	-4.27524	1976	-4.48	1989	-4.532	1994.71
1976	0.37	0.08	1986	-2.72	0.03	1994.583	-3.92	1960	-0.91	1967	9.518	0.042	1984.15	-0.72	-5.99	1841	-4.26358	1975	-4.17	1988	-4.577	1994.63
1975	-0.37	-0.09	1985	-2.83	0.03	1994.417	-3.66	1954	-0.89	1967	9.5	0.039	1984.1	-0.87	-5.62	1841.17	-4.23649	1974		1987	-4.59	1994.54
1974	0.01	-0.04	1984	-2.73	0.03	1994.25	-3.38	1947	-0.87	1962	9.483	0.028	1984.04	-0.74	-5.55	1841.33	-4.35253	1973		1986	-4.449	1994.46
1973	0.12	0.11	1983	-2.98	0.03	1994.083	-2.99	1940	-0.85	1960	9.584	0.079	1983.98	-1.28	-5.62	1841.5	-4.26747	1972	-4.65	1985	-4.477	1994.38
1972	0.21	0.20	1982	-2.69	0.02	1993.917	-3.42	1932	-0.78	1957	9.536	0.056	1983.92	-1.19	-5.94	1841.67	-4.23536	1971	-4.37	1984	-4.498	1994.29
1971	0.24	0.32	1981	-2.73	0.04	1993.75	-3.72	1926	-0.78	1954	9.267	0.03	1983.87	-1.25	-5.77	1841.83	-4.2388	1970	-4.35	1983	-4.571	1994.21
1970	0.64	0.41	1980	-2.74	0.02	1993.583	-3.9	1921	-0.89	1947	9.468	0.059	1983.75	-0.67	-6.17	1842	-4.26778	1969	-4.54	1982	-4.552	1994.13
1969	0.20	0.20	1979	-2.99	0.05	1993.417	-3.81	1915	-0.86	1940	9.618	0.017	1983.66	-1.1	-6.19	1842.17	-4.25513	1968	-4.35	1981	-4.544	1994.04
1968	-0.23	0.01	1978	-2.69	0.03	1993.25	-3.55	1909	-0.87	1932	9.435	0.053	1983.57	-1.03	-6.02	1842.33	-4.28571	1967	-4.14	1980	-4.629	1993.96
1967	0.25	0.07	1977	-2.8	0.03	1993.083	-2.74	1904	-0.78	1926	9.696	0.063	1983.48	-0.45	-6.17	1842.5	-4.33083	1966	-4.23	1979	-4.557	1993.88
1966	0.04	0.02	1976	-2.77	0.02	1992.917	-3.14	1899	-0.87	1921	9.604	0.03	1983.39	0.03	-5.6	1842.67	-4.41569	1965	-4.54	1978	-4.521	1993.79
1965	-0.25	-0.01	1975	-2.78	0.02	1992.75	-3.64	1893	-0.82	1915	9.603	0.006	1983.3	-0.01	-5.6	1842.83	-4.39296	1964	-4.31	1977	-4.5	1993.71
1964	0.40	0.10	1974	-2.54	0.02	1992.583	-3.79	1888	-0.82	1909	9.728	0.068	1983.2	-0.23	-5.85	1843	-4.39101	1963	-4.38	1976	-4.56	1993.63
1963	-0.15	0.02	1973	-2.7	0.02	1992.417	-3.95	1883	-0.84	1904	9.774	0.054	1983.11	-0.65	-6.2	1843.17	-4.35964	1962	-4.44	1975	-4.334	1993.54
1962	0.02	-0.01	1972	-2.75	0.03	1992.25	-3.17	1878	-0.94	1899	9.658	0.02	1983.02	-0.97	-6.41	1843.33	-4.33743	1961		1974	-4.411	1993.46
1961	0.07	-0.04	1971	-2.84	0.03	1992.083	-2.84	1873	-0.84	1893	9.665	0.054	1982.93	-0.92	-6.5	1843.5	-4.34084	1960		1973	-4.423	1993.38
1960	-0.27	-0.18	1970	-2.72	0.03	1991.917	-3.37	1869	-0.83	1888	9.755	0.041	1982.75	-0.93	-6.51	1843.67	-4.41615	1959		1972	-4.378	1993.29
1959	-0.25	-0.23	1969	-2.92	0.02	1991.75	-3.69	1864	-0.82	1883	9.541	0.054	1982.64	-1.26	-6.56	1843.83	-4.54832	1958		1971	-4.345	1993.21
1958	-0.27	-0.05	1968	-2.87	0.02	1991.583	-3.68	1864	-0.81	1878	9.668	0.071	1982.53	-1.13	-6.5	1844	-4.48642	1957		1970	-4.376	1993.13
1957	0.62	0.22	1967	-2.65	0.04	1991.417	-3.59	1860	-0.87	1873	9.702	0.03	1982.42	-0.45	-6.21	1844.17	-4.41777	1956		1969	-4.349	1993.04
1956	0.02	0.03	1966	-2.89	0.03	1991.25	-3.32	1855	-0.91	1869	9.712	0.051	1982.31	-0.73	-5.81	1844.33	-4.30936	1955		1968	-4.323	1992.96
1955	-0.50	-0.24	1965	-2.9	0.02	1991.083	-3.12	1850	-0.74	1864	9.64	0.034	1982.19	-0.37	-5.9	1844.5	-4.35426	1954		1967	-4.369	1992.88
1954	-0.13	-0.14	1964	-3.02	0.02	1990.917	-3.5	1845	-0.87	1860	9.729	0.044	1982.08	-0.32	-5.79	1844.67	-4.27631	1953		1966	-4.351	1992.79
1953	0.17	0.05	1963	-2.88	0.03	1990.75	-3.65	1840	-0.8	1855	9.63	0.041	1981.97	-0.84	-6.14	1844.83	-4.15608	1953	-4.18	1965	-4.279	1992.71
1952	0.06	0.06	1962	-2.88	0.02	1990.583	-3.85	1834	-0.71	1850	9.81	0.076	1981.75	-0.98	-6.5	1845	-4.11232	1952	-3.94	1964	-4.186	1992.63
1951	0.03	-0.10	1961	-2.64	0.02	1990.417	-3.58	1830	-0.68	1845	9.727	0.057	1981.65	-1.28	-6.28	1845.17	-4.1459	1951	-3.92	1963	-4.288	1992.54
1950	-0.57	-0.28	1960	-2.78	0.02	1990.25	-3.16	1826	-0.73	1840	9.849	0.057	1981.55	-0.47	-5.94	1845.33	-4.33724	1950	-3.5	1962	-4.294	1992.46
1949	-0.05	-0.22	1959	-2.96	0.01	1990.083	-2.92	1821	-0.66	1834	9.761	0.021	1981.45	-0.49	-5.95	1845.5	-4.56093	1949	-3.84	1961	-4.318	1992.38
1948	-0.24	-0.21	1958	-2.79	0.03	1989.917	-3.25	1817	-0.68	1830	9.82	0.082	1981.35	-0.03	-5.58	1845.67	-4.71767	1948	-4.03	1960	-4.369	1992.29
1947	-0.27	-0.22	1957	-2.91	0.03	1989.75	-3.73	1813	-0.68	1821	9.685	0.078	1981.25	-0.05	-5.38	1845.83	-4.67119	1947	-3.67	1959	-4.34	1992.21
1946	-0.16	-0.09	1956	-2.75	0.02	1989.583	-3.9	1808	-0.65	1817	9.902	0.039	1981.15	-0.07	-5.54	1846	-4.64852	1946	-3.79	1958	-4.291	1992.13
1945	0.23	0.08	1955	-2.82	0.03	1989.417	-3.57	1805	-0.95	1813	9.874	0.065	1981.05	0.07	-5.41	1846.17	-4.6036	1945	-3.69	1957	-4.356	1992.04
1944	0.04	0.11	1954	-3.13	0.01	1989.25	-3.29	1800	-0.73	1808	9.887	0.067	1980.95	-0.65	-6.25	1846.33	-4.71372	1944	-3.68	1956	-4.387	1991.96
1943	0.16	0.14	1953	-3.06	0.01	1989.083	-3.04	1795	-0.77	1805	9.878	0.082	1980.75	-1.18	-6.43	1846.5	-4.43077	1943	-3.88	1955	-4.349	1991.88
1942	0.18	0.16	1953	-3.15	0.03	1988.917	-3.48	1784	-0.61	1800	9.827	0.081	1980.66	-1.14	-6.24	1846.67	-4.27175	1942	-4.09	1954	-4.41	1991.79
1941	0.10	0.20	1952	-2.67	0.03	1988.75	-3.84	1780	-0.67	1795	9.797	0.233	1980.57	-0.7	-6.25	1846.83	-4.23166	1941	-4.29	1953	-4.369	1991.71
1940	0.50	0.20	1951	-2.75	0.01	1988.583	-4.02	1775	-0.79	1784	9.706	0.03	1980.48	-0.75	-6.23	1847	-4.25714	1940	-4.2	1952	-4.408	1991.63
1939	-0.31	-0.02	1950	-2.69	0.04	1988.417	-3.84	1770	-0.68	1784	9.84	0.048	1980.39	-0.25	-6.07	1847.17	-4.24717	1939	-4.04	1951	-4.343	1991.54
1938	0.02	-0.03	1949	-2.81	0.01	1988.25	-3.54	1765	-0.71	1780	9.62	0.102	1980.3	-0.6	-5.94	1847.33	-4.10298	1938	-3.81	1950	-4.35	1991.46

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	Quinn et al. 1996:		mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O		Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-5.089	1979	-4.72		1986	-1.08	1998.75	4.08E-06	1996.92	9.58	24.14	-0.27	1979.58	-4.72	1993.91667	-2.953931113	-4.163073644	1995.625	-0.75	-4.02	9.1801
-5.105	1978	-4.78		1985	-0.63	1998.736	4.13E-06	1996.84	9.51	25.04	-0.26	1979.08	-4.69	1993.75	-3.14779926	-3.860750918	1995.458	-0.58	-4.42	9.14187
-4.839	1977	-5.03		1984	-1.23	1998.722	4.17E-06	1996.75	9.51	25.04	-0.25	1978.58	-4.87	1993.58333	-3.232123358	-3.850605294	1995.291	-0.54	-4.59	9.013
-4.832	1976	-5.13		1983	-1.14	1998.708	4.11E-06	1996.67	9.59	24.03	-0.24	1978.08	-5.14	1993.41667	-3.271564343	-4.011093962	1995.125	-0.04	-4.91	8.9092
-4.925	1975	-5.16		1982	-1.44	1998.694	4.05E-06	1996.59	9.55	24.52	-0.23	1977.58	-4.79	1993.25	-3.302203716	-3.996311172	1994.958	-0.54	-4.61	9.0079
-4.937	1974	-5.24		1981	-0.43	1998.68	0.000004	1996.5	9.54	24.63	-0.22	1977.08	-5.19	1993.08333	-3.075897673	-3.95995029	1994.791	-0.8	-4.25	9.1113
-4.915	1973	-5.13		1980	-1.95	1998.666	0.000004	1996.42	9.35	26.95	-0.21	1976.58	-4.91	1992.91667	-2.609109598	-3.899417728	1994.625	-0.48	-3.91	9.1597
-4.807	1972	-4.87		1979	-0.55	1998.653	4.01E-06	1996.34	9.37	26.66	-0.2	1976.08	-5.4	1992.75	-2.896120587	-3.587032185	1994.458	-0.58	-4.16	9.03513
-4.849	1971	-4.79		1978	-1.51	1998.639	4.01E-06	1996.25	9.27	27.89	-0.19	1975.58	-5	1992.58333	-3.481747858	-4.018050989	1994.291	-0.65	-4.72	9.00261
-4.925	1970	-4.93		1977	-0.35	1998.625	4.01E-06	1996.17	9.28	27.76	-0.18	1975.08	-5.34	1992.41667	-3.389033932	-4.215138895	1994.125	-0.44	-4.76	8.99384
-5.06	1969	-4.92		1976	-0.45	1998.611	0.000004	1996.09	9.33	27.13	-0.17	1974.58	-4.79	1992.25	-3.202335846	-4.078640306	1993.958	-0.66	-4.61	9.06273
-5.129	1968	-4.93		1975	-0.16	1998.597	0.000004	1996	9.35	26.95	-0.16	1974.08	-5.1	1992.08333	-3.184196324	-4.1239853	1993.791	-0.59	-4.25	9.2065
-4.98	1967	-5.1		1974	1.61	1998.583	4.04E-06	1995.92	9.48	25.37	-0.15	1973.58	-4.83	1991.91667	-3.496986206	-4.111652842	1993.625	-0.54	-4.01	9.20897
-4.864	1966	-4.97		1973	-1.22	1998.569	4.08E-06	1995.84	9.5	25.17	-0.15	1973.08	-4.96	1991.75	-3.105815657	-3.732402071	1993.458	-0.57	-4.42	9.17053
-4.844	1965	-4.88		1972	0.34	1998.555	4.13E-06	1995.75	9.55	24.57	-0.14	1972.58	-4.61	1991.58333	-3.443547943	-3.842578668	1993.291	-0.45	-4.8	8.98748
-4.837	1964	-4.82		1971	-0.35	1998.535	4.11E-06	1995.67	9.54	24.59	-0.13	1972.08	-4.9	1991.41667	-3.142527049	-4.205119876	1993.125	-0.34	-4.93	8.8423
-4.84	1963	-4.84		1970	-1.03	1998.514	4.09E-06	1995.59	9.5	25.13	-0.13	1971.58	-4.9	1991.25	-2.946478608	-4.427054064	1992.958	-0.49	-4.8	8.97667
-4.791	1962	-5.15		1969	-1.5	1998.494	4.07E-06	1995.5	9.48	25.42	-0.12	1971.08	-5.11	1991.08333	-2.727240849	-4.229353781	1992.791	-0.54	-4.33	9.07307
-4.672	1961	-5.24		1968	0.8	1998.473	4.13E-06	1995.42	9.43	25.98	-0.12	1970.58	-4.97	1990.91667	-2.702833693	-3.910885052	1992.625	-0.9	-4.11	9.2167
-4.614	1960	-5.27		1967	-1.74	1998.453	4.18E-06	1995.34	9.38	26.62	-0.11	1970.08	-5.1	1990.75	-3.644862376	-3.563157893	1992.458	-1.31	-4.46	9.08423
-4.658	1959	-5.1		1966	-2.05	1998.433	4.21E-06	1995.25	9.31	27.4	-0.11	1969.58	-4.72	1990.58333	-3.746701756	-3.88116237	1992.291	-0.93	-4.65	8.9586
-4.826	1958	-5.13		1965	-1.49	1998.412	4.2E-06	1995.17	9.35	27	-0.1	1969.08	-5.2	1990.41667	-3.457305078	-4.143209432	1992.125	-0.41	-4.82	8.96838
-4.95	1957	-5.05		1964	-1.38	1998.392	4.16E-06	1995.09	9.38	26.55	-0.1	1968.58	-4.78	1990.25	-3.318681952	-4.214743274	1991.958	-0.63	-4.47	9.03786
-5.181	1956	-4.91		1963	-0.73	1998.371	4.12E-06	1995	9.41	26.23	-0.1	1968.08	-5.19	1990.08333	-3.504789969	-4.388641305	1991.791	-0.59	-4.33	9.17196
-5.158	1955	-4.73		1962	-0.87	1998.351	4.17E-06	1994.92	9.49	25.23	-0.1	1967.58	-4.91	1989.91667	-3.042924937	-3.933110374	1991.625	-0.58	-3.92	9.1882
-4.93	1954	-5.23		1961	-1.6	1998.331	4.24E-06	1994.84	9.52	24.85	-0.09	1967.08	-5.19	1989.75	-2.914769338	-3.822120203	1991.458	-0.58	-4.34	9.07809
-4.815	1953	-5.14		1960	-1.53	1998.31	4.32E-06	1994.75	9.55	24.58	-0.09	1966.58	-4.56	1989.58333	-3.40098103	-4.114410242	1991.291	-0.38	-4.83	8.95574
-4.862	1952	-5.1		1959	-0.61	1998.29	4.42E-06	1994.67	9.6	23.91	-0.09	1966.08	-4.99	1989.41667	-3.415758572	-4.24135092	1991.125	-0.42	-5.22	8.92015
-4.838	1951	-5.04		1958	0.5	1998.269	4.53E-06	1994.59	9.58	24.2	-0.09	1965.58	-4.65	1989.25	-3.141883048	-4.336428675	1990.958	-0.63	-4.57	8.97981
-4.743	1950	-5.1		1957	-1.37	1998.249	4.65E-06	1994.5	9.54	24.63	-0.08	1965.08	-5.14	1989.08333	-2.746871604	-4.383555777	1990.791	-0.69	-4.24	9.13896
-4.647	1949	-5.21		1956	-0.03	1998.228	4.74E-06	1994.42	9.45	25.73	-0.08	1964.58	-4.88	1988.91667	-3.138137798	-4.043173582	1990.625	-0.67	-4.01	9.2503
-4.571	1948	-5.21		1955	0.41	1998.208	4.84E-06	1994.34	9.36	26.85	-0.08	1964.08	-5	1988.75	-3.11536133	-3.822884867	1990.458	-0.48	-4.21	9.13372
-4.703	1947	-5.06		1954	0.75	1998.188	4.93E-06	1994.25	9.3	27.57	-0.08	1963.58	-4.78	1988.58333	-3.235267324	-3.969551677	1990.291	-0.32	-4.53	9.14498
-4.982	1946	-5.08		1953	-0.07	1998.167	5.19E-06	1994.17	9.24	28.28	-0.08	1963.08	-5.35	1988.41667	-3.497342093	-4.105980945	1990.125	0.23	-4.63	8.9489
-5.217	1945	-4.92		1952	-1.04	1998.147	5.4E-06	1994.09	9.32	27.29	-0.08	1962.58	-5.1	1988.25	-2.971316859	-4.18450184	1989.958	-0.38	-4.55	8.97735
-5.124	1944	-5.06		1951	0.56	1998.126	6.54E-06	1994	9.37	26.73	-0.07	1962.08	-5.36	1988.08333	-3.184933833	-4.19887648	1989.791	-0.47	-4.21	9.08821
-5.014	1943	-5.1		1950	0.54	1998.106	7.97E-06	1993.92	9.48	25.37	-0.07	1961.58	-5.1	1987.91667	-3.034741377	-3.847791147	1989.625	-0.42	-4.08	9.12629
-4.908	1942	-5.04		1949	-0.73	1998.086	7.72E-06	1993.84	9.49	25.2	-0.07	1961.08	-5.42	1987.75	-3.074770616	-3.761650528	1989.458	-0.3	-4.37	9.10043
-4.957	1941	-4.94		1948	-1.29	1998.065	5.98E-06	1993.75	9.59	24.08	-0.07	1960.58	-4.84	1987.58333	-3.112723852	-3.836681794	1989.291	-0.07	-4.74	8.99855
-4.941	1940	-5.09		1947	-0.8	1998.045	4.12E-06	1993.67	9.63	23.55	-0.07	1960.08	-5.06	1987.41667	-3.119804226	-4.023695669	1989.125	0.15	-4.67	9.03014
-4.994	1939	-4.94		1946	-0.28	1998.024	3.73E-06	1993.59	9.6	23.88	-0.07	1959.58	-4.35	1987.25	-2.940227373	-4.05732882	1988.958	-0.45	-4.37	9.09614
-4.958	1938	-5.1		1945	-1.43	1998.004	3.62E-06	1993.5	9.56	24.37	-0.07	1959.08	-5.01	1987.08333	-2.868193119	-4.143704702	1988.791	-0.1	-4.32	9.16035
-4.778	1937	-5.02		1944	-0.6	1997.984	3.54E-06	1993.42	9.52	24.88	-0.07	1958.58	-4.98	1986.91667	-2.68654334	-4.130249085	1988.625	-0.39	-4.07	9.2572
-4.685	1936	-5.08		1943	-0.79	1997.963	3.69E-06	1993.34	9.44	25.85	-0.07	1958.08	-4.83	1986.75	-2.620629128	-3.577602583	1988.458	-0.68	-4.31	9.12235
-4.74	1935	-5.08		1942	-1.35	1997.943	3.71E-06	1993.25	9.38	26.61	-0.06	1957.58	-4.74	1986.58333	-3.56359247	-3.768208741	1988.291	0.4	-5	8.96524

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1937	0.08	0.06	1948	-2.96	0.03	1988.083	-3.23	1761	-0.76	1780	9.787	0.046	1980.2	-0.47	-5.75	1847.5	-4.02996	1937	-3.93	1949	-4.524	1991.38
1936	0.08	0.07	1947	-3.18	0.04	1987.917	-3.38	1756	-0.78	1765	9.702	0.097	1980.11	-0.54	-5.75	1847.67	-4.13412	1936	-3.96	1948	-4.457	1991.29
1935	0.07	0.07	1946	-2.81	0.03	1987.75	-3.69	1754	-0.75	1756	9.763	0.172	1980.02	-0.58	-5.8	1847.83	-4.289	1935	-3.83	1947	-4.441	1991.21
1934	0.05	0.05	1945	-2.93	0.02	1987.583	-3.76	1747	-0.67	1754	9.751	0.059	1979.93	-0.73	-6.12	1848	-4.33473	1934	-4.05	1946	-4.45	1991.13
1933	0.09	-0.04	1944	-2.72	0.01	1987.417	-3.45	1744	-0.76	1747	9.564	0.047	1979.75	-1.11	-6.32	1848.17	-4.26245	1933	-3.86	1945	-4.489	1991.04
1932	-0.38	-0.20	1943	-2.68	0.02	1987.25	-3.22	1739	-0.74	1744	9.735	0.148	1979.67	-1.23	-6.34	1848.33	-4.24121	1932	-4.09	1944	-4.417	1990.96
1931	-0.14	-0.18	1942	-2.92	0.01	1987.083	-3.32	1735	-0.77	1739	9.779	0.075	1979.58	-1.08	-6.25	1848.5	-4.31697	1931	-4.01	1943	-4.387	1990.88
1930	-0.12	-0.08	1941	-3.13	0.02	1986.917	-3.81	1730	-0.79	1739	9.662	0.034	1979.5	-0.96	-6.03	1848.67	-4.29409	1930	-4.12	1942	-4.507	1990.79
1929	0.09	-0.02	1940	-2.86	0.03	1986.75	-3.91	1726	-0.78	1735	9.811	0.17	1979.42	-0.98	-6.08	1848.83	-4.20666	1929	-3.9	1941	-4.506	1990.71
1928	-0.15	-0.06	1939	-3.11	0.01	1986.583	-3.88	1722	-0.84	1730	9.65	0.093	1979.33	-1.31	-6.11	1849	-4.20363	1928	-3.71	1940	-4.476	1990.63
1927	0.00	-0.12	1938	-2.93	0.02	1986.417	-3.79	1718	-0.72	1726	9.806	0.117	1979.25	-0.41	-5.78	1849.17	-4.19193	1927	-3.88	1939	-4.517	1990.54
1926	-0.36	-0.23	1937	-2.91	0.01	1986.25	-3.45	1714	-0.78	1722	9.769	0.027	1979.17	-0.47	-5.72	1849.33	-4.32478	1926	-3.81	1938	-4.441	1990.46
1925	-0.21	-0.21	1936	-2.72	0.01	1986.083	-3.23	1705	-0.8	1718	9.704	0.077	1979.08	-0.47	-5.75	1849.5	-4.5007	1925	-4.02	1937	-4.414	1990.38
1924	-0.05	-0.19	1935	-2.76	0.01	1985.917	-3.43	1705	-0.75	1714	9.704	0.026	1979	-0.6	-5.91	1849.67	-4.52619	1924	-4	1936	-4.452	1990.29
1923	-0.43	-0.26	1934	-2.88	0.03	1985.75	-3.8	1701	-0.78	1709	9.827	0.118	1978.92	-0.64	-5.97	1849.83	-4.54406	1923	-4.04	1935	-4.427	1990.21
1922	-0.13	-0.25	1933	-2.94	0.02	1985.583	-4.08	1698	-0.8	1705	9.767	0.201	1978.75	-0.91	-6.12	1850	-4.46622	1922	-4.17	1934	-4.323	1990.13
1921	-0.35	-0.25	1932	-3	0.02	1985.417	-3.68	1694	-0.78	1701	9.832	0.178	1978.64	-0.82	-6.1	1850.17	-4.46001	1921	-3.99	1933	-4.48	1990.04
1920	-0.21	-0.16	1931	-2.78	0.04	1985.25	-3.34	1690	-0.81	1698	9.798	0.026	1978.53	-0.83	-6.14	1850.33	-4.35585	1920	-3.89	1932	-4.51	1989.96
1919	0.19	-0.13	1930	-2.74	0.02	1985.083	-3.32	1686	-0.81	1694	9.826	0.128	1978.42	-0.87	-5.87	1850.5	-4.30938	1919	-4.02	1931	-4.53	1989.88
1918	-0.64	-0.34	1929	-2.87	0.02	1984.917	-3.8	1682	-0.76	1694	9.789	0.039	1978.31	-0.42	-5.46	1850.67	-4.33952	1918	-4.16	1930	-4.453	1989.79
1917	-0.34	-0.26	1928	-2.74	0.02	1984.75	-3.93	1682	-0.73	1690	9.98	0.072	1978.19	-0.73	-5.41	1850.83	-4.40717	1917	-3.65	1929	-4.382	1989.71
1916	0.27	-0.09	1927	-2.74	0.02	1984.583	-3.78	1677	-0.82	1690	9.82	0.046	1978.08	-0.22	-5.31	1851	-4.5177	1916	-4	1928	-4.35	1989.63
1915	-0.52	-0.25	1926	-2.76	0.04	1984.417	-3.56	1674	-0.75	1690	9.759	0.026	1977.97	0.17	-5.65	1851.17	-4.66379	1915	-3.89	1927	-4.408	1989.54
1914	-0.19	-0.26	1925	-2.79	0.03	1984.25	-3.33	1671	-0.84	1686	9.792	0.11	1977.75	-0.18	-6.09	1851.33	-4.8209	1914	-3.81	1926	-4.388	1989.46
1913	-0.21	-0.21	1924	-2.8	0.04	1984.083	-3.2	1667	-0.82	1686	9.758	0.076	1977.66	-0.64	-5.9	1851.5	-4.63063	1913	-3.9	1925	-4.361	1989.38
1912	-0.21	-0.16	1923	-2.78	0.05	1983.917	-3.3	1663	-0.77	1682	9.836	0.05	1977.57	-0.52	-5.95	1851.67	-4.52546	1912	-3.95	1924	-4.342	1989.29
1911	-0.04	-0.07	1922	-2.79	0.02	1983.75	-3.67	1660	-0.76	1682	9.687	0.075	1977.48	-0.18	-5.92	1851.83	-4.46985	1911	-4.08	1923	-4.352	1989.21
1910	0.02	-0.02	1921	-2.65	0.02	1983.583	-3.71	1656	-0.69	1677	9.861	0.133	1977.39	-0.77	-5.76	1852	-4.45546	1910	-3.82	1922	-4.368	1989.13
1909	-0.05	-0.07	1920	-2.81	0.03	1983.417	-3.53	1654	-0.81	1677	9.732	0.054	1977.3	0.15	-5.47	1852.17	-4.55776	1906	-4.13	1921	-4.356	1989.04
1908	-0.19	-0.15	1919	-2.48	0.02	1983.25	-3.05	1650	-0.73	1674	9.902	0.064	1977.2	0.26	-5.27	1852.33	-4.53621	1905	-4.34	1920	-4.337	1988.96
1907	-0.21	-0.13	1918	-2.85	0.03	1983.083	-2.93	1646	-0.81	1674	9.75	0.016	1977.11	-0.03	-5.43	1852.5	-4.48287	1904	-3.94	1919	-4.352	1988.88
1906	0.10	-0.10	1917	-2.87	0.03	1982.917	-3.44	1643	-0.7	1671	9.792	0.024	1977.02	-0.1	-5.51	1852.67	-4.4805	1903	-4.21	1918	-4.338	1988.79
1905	-0.36	-0.27	1916	-2.57	0.03	1982.75	-3.83	1639	-0.73	1671	9.704	0.074	1976.93	-0.28	-6.11	1852.83	-4.50311	1902	-4.32	1917	-4.341	1988.71
1904	-0.51	-0.27	1915	-2.51	0.05	1982.583	-3.97	1636	-0.68	1667	9.529	0.04	1976.75	-0.59	-6.4	1853	-4.40261	1901	-4.14	1916	-4.354	1988.63
1903	0.22	0.05	1914	-2.8	0.05	1982.417	-3.86	1633	-0.77	1667	9.608	0.092	1976.68	-0.93	-6.21	1853.17	-4.39529	1900	-3.75	1915	-4.436	1988.54
1902	0.35	0.14	1913	-2.71	0.04	1982.25	-3.38	1630	-0.81	1663	9.75	0.068	1976.55	-1	-6.14	1853.33	-4.39959	1899	-3.71	1914	-4.464	1988.46
1901	-0.27	-0.03	1912	-2.55		1982.083	-3.08	1627	-0.77	1663	9.769	0.017	1976.48	-1.27	-6.26	1853.5	-4.36106	1898	-3.96	1913	-4.406	1988.38
1900	0.08	-0.11	1911	-2.92	0.02	1981.917	-3.26	1624	-0.67	1660	9.773	0.07	1976.42	-0.92	-5.97	1853.67	-4.27042	1897	-3.85	1912	-4.398	1988.29
1899	-0.42	-0.14	1910	-2.76	0.02	1981.75	-3.55	1624	-0.74	1660	9.681	0.082	1976.35	-0.29	-5.74	1853.83	-4.23562	1896	-4.15	1911	-4.245	1988.21
1898	0.32	-0.18	1909	-2.65	0.03	1981.583	-4.03	1622	-0.73	1656	9.845	0.049	1976.28	-0.26	-6	1854	-4.31626	1895	-4	1910	-4.266	1988.13
1897	-1.01	-0.44	1908	-2.79	0.03	1981.417	-3.99	1621	-0.81	1656	9.735	0.062	1976.22	-0.3	-5.58	1854.17	-4.40589	1894	-4.07	1909	-4.352	1988.04
1896	-0.05	-0.33	1907	-2.8	0.04	1981.25	-3.59	1618	-0.76	1654	9.656	0.057	1976.15	-0.19	-5.48	1854.33	-4.44774	1893	-4.06	1908	-4.279	1987.96
1895	-0.33	-0.20	1906	-2.76	0.02	1981.083	-3.32	1618	-0.74	1650	9.824	0.117	1976.08	-0.16	-5.69	1854.5	-4.30546	1892	-3.9	1907	-4.387	1987.88
1894	0.01	-0.13	1905	-2.72	0.03	1980.917	-3.52	1616	-0.81	1650	9.77	0.065	1976.02	-0.18	-5.6	1854.67	-4.18683	1891	-4.05	1906	-4.511	1987.79
1893	-0.16	-0.21	1904	-2.9	0.03	1980.75	-3.73	1614	-0.74	1646	9.778	0.074	1975.95	-0.71	-5.81	1854.83	-4.27428	1890	-3.69	1905	-4.355	1987.71

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	Quinn et al. 1996:		mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O		Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.792	1934	-5.21		1941	-0.65	1997.922	3.56E-06	1993.17	9.29	27.68	-0.06	1957.08	-4.77	1986.41667	-3.378316447	-4.004048641	1988.125	-0.1	-4.92	9.0876
-5.017	1933	-5.13		1940	0.86	1997.902	3.59E-06	1993.09	9.3	27.5	-0.06	1956.58	-4.84	1986.25	-2.923389839	-3.970842162	1987.958	-0.6	-4.53	9.00573
-5.033	1932	-5.13		1939	-0.9	1997.882	3.76E-06	1993	9.39	26.41	-0.06	1956.08	-4.44	1986.08333	-3.214199692	-4.119873051	1987.791	-0.74	-4.23	9.0894
-4.887	1931	-5.23		1938	-0.9	1997.861	3.7E-06	1992.92	9.43	25.93	-0.06	1955.58	-4.58	1985.91667	-3.09095314	-3.698366446	1987.625	-0.84	-3.93	9.1838
-4.865	1930	-5.15		1937	-0.84	1997.841	3.69E-06	1992.84	9.44	25.89	-0.06	1955.08	-5.3	1985.75	-3.242642443	-3.696303826	1987.458	-0.66	-4.32	9.15084
-4.887	1929	-5.09		1936	-0.83	1997.82	3.87E-06	1992.75	9.49	25.25	-0.06	1954.58	-5.06	1985.58333	-3.417114088	-3.77787052	1987.291	-0.57	-4.79	9.03109
-4.818	1928	-4.89		1935	-1.22	1997.8	3.69E-06	1992.67	9.53	24.8	-0.06	1954.08	-5	1985.41667	-3.449036022	-4.001584228	1987.125	0.05	-4.73	8.9452
-4.761	1927	-5.08		1934	0.46	1997.779	3.71E-06	1992.59	9.55	24.46	-0.06	1953.58	-4.82	1985.25	-3.062372592	-4.259604064	1986.958	-0.53	-4.52	8.98393
-4.748	1926	-5.17		1933	0.62	1997.759	3.7E-06	1992.5	9.51	25.03	-0.06	1953.08	-5.03	1985.08333	-2.691973988	-3.838967809	1986.791	-0.61	-4.22	9.10593
-4.666	1925	-5.08		1932	-1.24	1997.739	3.66E-06	1992.42	9.4	26.34	-0.06	1952.58	-5.13	1984.91667	-2.851718124	-3.920786773	1986.625	-0.7	-3.95	9.2007
-4.505	1924	-5.12		1931	-1.6	1997.718	3.64E-06	1992.34	9.35	26.94	-0.06	1952.08	-5.05	1984.75	-2.811684436	-3.656780203	1986.458	-0.53	-4.33	9.06733
-4.547	1923	-5.19		1930	-0.28	1997.698	3.72E-06	1992.25	9.33	27.18	-0.06	1951.58	-5.16	1984.58333	-3.08974681	-4.070168227	1986.291	-0.44	-4.71	8.97192
-4.671	1922	-5.13		1929	-0.58	1997.677	3.74E-06	1992.17	9.34	27.1	-0.06	1951.08	-5.39	1984.41667	-3.134929342	-4.209543885	1986.125	-0.62	-4.72	8.9672
-4.962	1921	-5.03		1928	-0.97	1997.657	3.66E-06	1992.09	9.36	26.77	-0.06	1950.58	-5.14	1984.25	-2.78310234	-4.156895068	1985.958	-0.01	-4.64	8.97486
-4.996	1920	-5.17		1927	0.42	1997.637	3.78E-06	1992	9.4	26.29	-0.06	1950.08	-5.2	1984.08333	-2.713657188	-4.025910967	1985.791	-0.38	-4.39	8.97061
-4.947	1919	-5.33		1926	-0.96	1997.616	3.75E-06	1991.92	9.45	25.76	-0.06	1949.58	-5.43	1983.91667	-2.839001518	-4.009848478	1985.625	-0.63	-4.04	9.0617
-4.879	1918	-5.07		1925	-0.05	1997.596	3.76E-06	1991.84	9.49	25.24	-0.07	1949.08	-5.06	1983.75	-2.602277242	-3.634906379	1985.458	-0.68	-4.28	9.1142
-4.815	1917	-5.09		1924	-0.3	1997.575	3.81E-06	1991.75	9.52	24.9	-0.07	1948.58	-5.41	1983.58333	-2.829800407	-3.756444554	1985.291	-0.72	-4.51	9.11018
-4.823	1916	-5.22		1923	-1.22	1997.555	3.78E-06	1991.67	9.54	24.58	-0.07	1948.08	-5.47	1983.41667	-3.186921062	-4.230894873	1985.125	-0.28	-4.75	8.98257
-4.783	1915	-5.04		1922	0.46	1997.535	3.91E-06	1991.59	9.61	23.85	-0.07	1947.58	-4.8	1983.25	-2.816481973	-4.223035002	1984.958	-0.4	-4.62	8.9863
-4.74	1914	-5.14		1921	-1.33	1997.515	3.89E-06	1991.5	9.54	24.59	-0.07	1947.08	-5.18	1983.08333	-2.881369109	-4.341944127	1984.791	-0.51	-4.3	9.01976
-4.652	1913	-4.94		1920	-1.2	1997.495	3.95E-06	1991.42	9.52	24.88	-0.08	1946.58	-5.19	1982.91667	-2.780374575	-3.908436949	1984.625	-0.85	-4.04	9.15
-4.626	1912	-5.01		1919	-1.66	1997.475	3.96E-06	1991.34	9.36	26.77	-0.08	1946.08	-5.18	1982.75	-3.013970405	-3.658384581	1984.458	-1.27	-4.14	9.02171
-4.678	1911	-5.19		1918	-0.05	1997.455	4.05E-06	1991.25	9.28	27.79	-0.08	1945.58	-4.86	1982.58333	-3.369198425	-3.988874102	1984.291	-0.95	-4.64	8.91059
-4.872	1910	-5.15		1917	0.56	1997.435	4.01E-06	1991.17	9.33	27.21	-0.08	1945.08	-5.03	1982.41667	-2.947630149	-4.077226949	1984.125	-0.32	-5.25	8.8972
-4.999	1909	-5.31		1916	-0.62	1997.415	4.04E-06	1991.09	9.38	26.61	-0.08	1944.58	-5.04	1982.25	-3.111922315	-4.386791413	1983.958	-0.63	-4.84	8.94967
-4.986	1908	-5.34		1915	-1.69	1997.395	3.95E-06	1991	9.43	25.95	-0.09	1944.08	-5.24	1982.08333	-2.630451721	-3.834384778	1983.791	-0.34	-4.32	9.02805
-4.763	1907	-5.13		1914	-0.84	1997.375	3.8E-06	1990.92	9.48	25.35	-0.09	1943.58	-4.96	1981.91667	-2.911866311	-3.770986069	1983.625	-0.44	-3.97	9.1817
-4.716	1906	-5.08		1913	-0.46	1997.355	3.69E-06	1990.84	9.52	24.87	-0.09	1943.08	-5.32	1981.75	-3.067184088	-3.690506043	1983.458	-0.78	-4.31	9.02654
-4.789	1905	-5		1912	-1.22	1997.335	3.79E-06	1990.75	9.56	24.44	-0.1	1942.58	-4.66	1981.58333	-3.16164984	-3.752710621	1983.291	-0.74	-4.61	8.96159
-4.995	1904	-5.23		1911	1.46	1997.315	4.4E-06	1990.67	9.6	23.91	-0.1	1942.08	-4.99	1981.41667	-3.153034423	-3.963753076	1983.125	-0.44	-4.76	9.02178
-4.878	1903	-5.16		1910	1	1997.295	5.22E-06	1990.59	9.54	24.59	-0.1	1941.58	-4.64	1981.25	-2.943853406	-4.124106365	1982.958	-0.46	-4.27	9.11384
-4.856	1902	-4.93		1909	-0.71	1997.275	5.59E-06	1990.5	9.48	25.35	-0.1	1941.08	-5.15	1981.08333	-2.984819831	-4.03010695	1982.791	-0.41	-4.04	9.06389
-4.665	1901	-5.05		1908	-0.88	1997.255	5.61E-06	1990.42	9.47	25.53	-0.11	1940.58	-4.85	1980.91667	-2.982175243	-3.838617553	1982.625	-0.68	-4.02	9.12483
-4.483	1900	-5.01		1907	-0.93	1997.235	5.79E-06	1990.34	9.38	26.54	-0.11	1940.08	-4.75	1980.75	-2.626830275	-3.575459158	1982.458	-0.49	-4.59	9.04428
-4.76	1899	-5.07		1906	1.01	1997.215	5.97E-06	1990.25	9.37	26.7	-0.12	1939.58	-5	1980.58333	-2.867098302	-3.686519975	1982.291	-0.4	-4.88	8.90961
-5.086	1898	-5.18		1905	-0.12	1997.195	5.98E-06	1990.17	9.38	26.61	-0.12	1939.08	-5.31	1980.41667	-3.240957174	-4.054337713	1982.125	-0.55	-4.76	8.91128
-5.169	1897	-5.18		1904	-0.71	1997.175	0.000006	1990.09	9.39	26.51	-0.12	1938.58	-5.11	1980.25	-2.614564113	-4.136274984	1981.958	-0.42	-4.48	8.99134
-4.974	1896	-4.97		1903	-0.13	1997.155	6.02E-06	1990	9.39	26.52	-0.13	1938.08	-5.36	1980.08333	-2.424337715	-4.402018473	1981.791	-0.29	-4.12	9.06001
-4.82	1895	-5.08		1902	-1.14	1997.135	5.92E-06	1989.92	9.41	26.22	-0.14	1937.58	-5.02	1979.91667	-2.423752768	-4.134338249	1981.625	-0.57	-3.76	9.2207
-4.932	1894	-5.04		1901	-0.55	1997.115	5.18E-06	1989.84	9.49	25.3	-0.14	1937.08	-5.28	1979.75	-2.680471713	-3.651192428	1981.458	-0.66	-4.07	9.05045
-4.872	1893	-5.25		1900	-1.14	1997.095	4.42E-06	1989.75	9.52	24.9	-0.15	1936.58	-4.74	1979.58333	-3.098118044	-4.039568934	1981.291	-0.67	-4.57	9.00245
-4.912	1892	-5.27		1899	-0.01	1997.075	3.84E-06	1989.67	9.48	25.37	-0.16	1936.08	-5.21	1979.41667	-3.008304729	-4.125789609	1981.125	-0.67	-5.04	9.0094
-4.916	1891	-5.29		1898	0.68	1997.055	3.78E-06	1989.59	9.48	25.42	-0.16	1935.58	-4.99	1979.25	-2.547957143	-4.171740639	1980.958	-0.49	-4.51	8.95533
-4.891	1890	-5.2		1897	-1.8	1997.035	3.68E-06	1989.5	9.45	25.71	-0.17	1935.08	-5.23	1979.08333	-2.454635058	-4.054158228	1980.791	-0.5	-4.16	9.08697

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1892	-0.50	-0.32	1903	-2.96	0.04	1980.583	-3.92	1612	-0.72	1643	9.782	0.027	1975.88	-0.67	-5.99	1855	-4.27224	1889	-4.08	1904	-4.449	1987.63
1891	-0.25	-0.09	1902	-2.77	0.02	1980.417	-3.8	1612	-0.76	1642	9.758	0.009	1975.75	-0.72	-6.21	1855.17	-4.00024	1888	-4.54	1903	-4.428	1987.54
1890	0.69	0.15	1901	-2.79	0.02	1980.25	-3.47	1610	-0.68	1642	9.756	0.073	1975.67	-0.64	-6.13	1855.33	-4.12791	1887	-4.29	1902	-4.439	1987.46
1889	-0.50	-0.03	1900	-2.57	0.04	1980.083	-3.27	1609	-0.72	1639	9.78	0.051	1975.58	-0.77	-6.24	1855.5	-4.37962	1886	-4.19	1901	-4.394	1987.38
1888	0.27	-0.02	1899	-2.71	0.02	1979.917	-3.48	1606	-0.67	1639	9.739	0.055	1975.5	-0.43	-6.05	1855.67	-4.32601	1885	-4.08	1900	-4.517	1987.29
1887	-0.24	-0.04	1898	-2.83	0.02	1979.75	-4.03	1605	-0.74	1639	9.757	0.056	1975.42	0.1	-5.92	1855.83	-4.20963	1884	-4.25	1899	-4.39	1987.21
1886	0.05	0.05	1897	-2.66	0.03	1979.583	-3.97	1603	-0.75	1636	9.731	0.025	1975.33	-0.3	-5.6	1856	-4.1877	1883	-3.79	1898	-4.523	1987.13
1885	0.33	0.14	1896	-2.74	0.02	1979.417	-3.63	1600	-0.76	1636	9.682	0.04	1975.25	-0.19	-5.75	1856.17	-4.20747	1882	-3.84	1897	-4.499	1987.04
1884	-0.06	-0.01	1895	-2.755		1979.25	-3.16	1597	-0.77	1636	9.677	0.055	1975.17	-0.23	-5.68	1856.33	-4.23195	1881	-4.02	1896	-4.534	1986.96
1883	-0.26	-0.15	1894	-2.75	0.04	1979.083	-3.23	1594	-0.85	1634	9.797	0.066	1975.08	-0.5	-6.04	1856.5	-4.25642	1880	-3.97	1895	-4.555	1986.88
1882	-0.03	-0.16	1893	-2.58	0.02	1978.917	-3.63	1591	-0.75	1634	9.67	0.071	1975	-0.54	-5.99	1856.67	-4.16683	1879	-3.72	1894	-4.381	1986.79
1881	-0.33	-0.21	1892	-2.78	0.04	1978.75	-3.8	1589	-0.73	1633	9.672	0.078	1974.92	-0.73	-6.23	1856.83	-4.03921	1878	-3.99	1893	-4.393	1986.71
1880	-0.13	-0.26	1891	-2.86	0.03	1978.583	-3.85	1585	-0.82	1631	9.731	0.04	1974.75	-1.13	-6.54	1857	-3.9116	1877	-4.05	1892	-4.444	1986.63
1879	-0.46	-0.36	1890	-2.65	0.02	1978.417	-3.69	1582	-0.74	1631	9.722	0.044	1974.69	-1.39	-6.62	1857.17	-3.97137	1876	-4.15	1891	-4.375	1986.54
1878	-0.38	-0.44	1889	-2.74	0.03	1978.25	-3.28	1580	-0.81	1630	9.701	0.038	1974.64	-1.07	-6.3	1857.33	-4.09362	1875	-4.04	1890	-4.432	1986.46
1877	-0.60	-0.44	1888	-2.79	0.03	1978.083	-3.03	1577	-0.87	1627	9.807	0.039	1974.58	-1.3	-6.37	1857.5	-4.16856	1874	-4.12	1889	-4.504	1986.38
1876	-0.21	-0.28	1887	-2.6	0.03	1977.917	-3.32	1575	-0.76	1627	9.722	0.055	1974.53	-1.33	-6.41	1857.67	-4.18042	1873	-4.3	1888	-4.444	1986.29
1875	-0.17	-0.08	1886	-2.92	0.03	1977.75	-3.71	1572	-0.84	1627	9.724	0.079	1974.47	-0.76	-6.08	1857.83	-4.1765	1872	-4	1887	-4.393	1986.21
1874	0.32	0.02	1885	-2.75	0.04	1977.583	-3.97	1570	-0.79	1624	9.792	0.018	1974.42	-0.42	-5.82	1858	-4.24251	1871	-4.3	1886	-4.406	1986.13
1873	-0.30	-0.19	1884	-2.67	0.01	1977.417	-3.66	1567	-0.81	1624	9.741	0.051	1974.36	-0.87	-5.89	1858.17	-4.32899	1870	-4.32	1885	-4.379	1986.04
1872	-0.47	-0.34	1883	-2.7	0.02	1977.25	-3.31	1565	-0.86	1624	9.737	0.041	1974.31	-0.72	-5.68	1858.33	-4.40603	1869	-4.15	1884	-4.314	1985.96
1871	-0.25	-0.19	1882	-2.82	0.03	1977.083	-3.05	1562	-0.81	1622	9.624	0.06	1974.25	-0.5	-5.7	1858.5	-4.42789	1868	-4.13	1883	-4.348	1985.88
1870	0.19	0.05	1881	-2.69	0.02	1976.917	-3.45	1559	-0.76	1622	9.539	0.095	1974.19	-0.88	-5.51	1858.67	-4.37995	1867	-4	1882	-4.408	1985.79
1869	0.22	0.00	1880	-2.88	0.02	1976.75	-3.68	1555	-0.87	1621	9.753	0.021	1974.14	-0.48	-5.66	1858.83	-4.19171	1866	-4.26	1881	-4.429	1985.71
1868	-0.62	-0.26	1879	-2.69	0.05	1976.583	-3.76	1551	-0.81	1618	9.851	0.055	1974.08	-0.95	-5.79	1859	-3.92156	1865	-4.41	1880	-4.561	1985.63
1867	-0.10	-0.19	1878	-2.79	0.03	1976.417	-3.74	1548	-0.78	1618	9.724	0.054	1974.03	-0.87	-6.27	1859.17	-3.90911	1864	-4.34	1879	-4.561	1985.54
1866	-0.02	-0.08	1877	-2.8	0.01	1976.25	-3.59	1546	-0.79	1618	9.668	0.063	1973.97	-1.14	-6.24	1859.33	-3.96686	1863	-4.17	1878	-4.568	1985.46
1865	-0.14	-0.05	1876	-2.88	0.04	1976.083	-3.02	1544	-0.88	1616	9.828	0.116	1973.92	-0.91	-6.59	1859.5	-4.03397	1862	-4.02	1877	-4.505	1985.38
1864	0.19	-0.08	1875	-2.61	0.04	1975.917	-3.29	1541	-0.89	1616	9.798	0.03	1973.86	-0.76	-6.55	1859.67	-4.10644	1861	-4.06	1876	-4.467	1985.29
1863	-0.58	-0.30	1874	-2.49	0.02	1975.75	-3.61	1537	-0.86	1616	9.557	0.075	1973.75	-0.55	-6.76	1859.83	-4.08618	1860	-4.1	1875	-4.492	1985.21
1862	-0.20	-0.36	1873	-2.74	0.02	1975.583	-3.87	1535	-0.74	1614	9.756	0.021	1973.64	-0.83	-6.6	1860	-4.04945	1859	-3.91	1874	-4.495	1985.13
1861	-0.53	-0.42	1872	-2.77	0.03	1975.417	-3.68	1532	-0.85	1610	9.805	0.053	1973.53	-0.46	-6.15	1860.17	-4.0138	1858	-3.9	1873	-4.548	1985.04
1860	-0.43	-0.34	1871	-2.68	0.02	1975.25	-3.35	1529	-0.84	1605	9.751	0.028	1973.42	-0.26	-5.96	1860.33	-4.04939	1857	-3.85	1872	-4.327	1984.96
1859	-0.04	-0.12	1870	-2.74	0.03	1975.083	-3.12	1527	-0.8	1603	9.787	0.024	1973.31	-0.06	-5.96	1860.5	-4.10047	1856	-4.01	1871	-4.481	1984.88
1858	0.02	0.03	1869	-2.72	0.03	1974.917	-3.8	1524	-0.83	1600	9.762	0.044	1973.19	-0.12	-5.68	1860.67	-4.14467	1855	-3.96	1870	-4.476	1984.79
1857	0.15	0.13	1868	-2.8	0.03	1974.75	-3.7	1520	-0.87	1597	9.742	0.046	1973.08	-0.3	-6.01	1860.83	-4.19467	1854	-4.11	1869	-4.474	1984.71
1856	0.28	0.08	1867	-2.57	0.02	1974.583	-4.19	1517	-0.86	1594	9.703	0.025	1972.97	-0.76	-6.58	1861	-4.20977	1853	-4.26	1868	-4.472	1984.63
1855	-0.39	-0.10	1866	-2.77	0.02	1974.417	-3.74	1514	-0.82	1591	9.666	0.012	1972.75	-1.24	-6.83	1861.17	-4.22018	1852	-4	1867	-4.514	1984.54
1854	0.08	0.00	1865	-2.67	0.02	1974.25	-3.26	1510	-0.8	1589	9.77	0.051	1972.67	-0.97	-6.64	1861.33	-4.25877	1851	-4.09	1866	-4.413	1984.46
1853	0.12	0.22	1864	-2.76	0.02	1974.083	-3.16	1510	-0.76	1585	9.738	0.01	1972.58	-0.94	-6.56	1861.5	-4.30871	1850	-3.97	1865	-4.436	1984.38
1852	0.60	0.40	1863	-2.69	0.03	1973.917	-3.54	1508	-0.78	1582	9.73	0.06	1972.5	-0.54	-6.49	1861.67	-4.30847	1849	-3.77	1864	-4.317	1984.29
1851	0.35	0.32	1862	-2.7		1973.75	-3.67	1505	-0.82	1580	9.74	0.022	1972.42	-0.43	-6.37	1861.83	-4.26482	1848	-3.67	1863	-4.441	1984.21
1850	0.07	0.06	1861	-2.68	0.02	1973.583	-3.75	1503	-0.88	1577	9.787	0.085	1972.33	-0.05	-5.67	1862	-4.24321	1847	-4.15	1862	-4.377	1984.13
1849	-0.35	-0.06	1860	-2.73	0.05	1973.417	-3.44	1503	-0.88	1575	9.761	0.017	1972.25	-0.36	-5.8	1862.17	-4.26143	1846	-3.98	1861	-4.345	1984.04
1848	0.24	0.28	1859	-2.72	0.02	1973.25	-3.13	1500	-0.94	1572	9.789	0.012	1972.17	-0.4	-5.96	1862.33	-4.28829	1845	-3.94	1860	-4.302	1983.96

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	Quinn et al. 1996:		Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.737	1889	-5.17	1896	0.77	1997.015	3.77E-06	1989.42	9.53	24.76	-0.18	1934.58	-5.14	1978.91667	-2.700802817	-4.351410891	1980.625	-0.77	-3.83	9.2304
-4.71	1888	-5.2	1895	0.01	1996.995	3.56E-06	1989.34	9.37	26.74	-0.19	1934.08	-5.19	1978.75	-2.496280011	-3.893129421	1980.458	-0.43	-4.48	9.03263
-4.734	1887	-5.22	1894	0.68	1996.975	3.55E-06	1989.25	9.28	27.79	-0.2	1933.58	-5.43	1978.58333	-2.796022838	-3.816720545	1980.291	-0.13	-4.85	8.99743
-4.905	1886	-5.1	1893	-0.36	1996.955	3.58E-06	1989.17	9.38	26.64	-0.21	1933.08	-5.32	1978.41667	-3.273292014	-4.3031303	1980.125	-0.28	-4.59	8.9219
-5.098	1885	-4.95	1892	-0.59	1996.935	3.65E-06	1989.09	9.38	26.6	-0.22	1932.58	-5.02	1978.25	-3.074585206	-4.559071832	1979.958	-0.51	-4.23	9.01243
-5.054	1884	-4.93	1891	2.39	1996.915	3.48E-06	1989	9.43	26.02	-0.23	1932.08	-5.22	1978.08333	-2.786642326	-4.380709182	1979.791	-0.48	-4.1	9.09597
-5.096	1883	-5	1890	2.3	1996.895	3.53E-06	1988.92	9.46	25.63	-0.25	1931.58	-5.01	1977.91667	-2.804364104	-4.203183398	1979.625	-0.82	-3.87	9.195
-4.929	1882	-5.16	1889	-1.55	1996.875	3.59E-06	1988.84	9.48	25.36	-0.26	1931.08	-5.15	1977.75	-2.814290945	-3.833024418	1979.458	-0.92	-4.26	8.99107
-5.08	1881	-5.22	1888	-0.23	1996.855	3.58E-06	1988.75	9.53	24.76	-0.27	1930.58	-4.8	1977.58333	-3.062286961	-3.878945287	1979.291	-0.4	-4.77	8.96659
-4.992	1880	-5.15	1887	1.57	1996.835	3.47E-06	1988.67	9.6	23.91	-0.29	1930.08	-5.19	1977.41667	-3.463189713	-3.984230766	1979.125	-0.39	-4.71	8.8942
-4.825	1879	-5.34	1886	-0.71	1996.815	3.44E-06	1988.59	9.54	24.61	-0.3	1929.58	-5.07	1977.25	-3.357647275	-4.159156924	1978.958	-0.52	-4.51	8.95399
-4.696	1878	-4.9	1885	-1.45	1996.795	3.61E-06	1988.5	9.48	25.37	-0.31	1929.08	-5.16	1977.08333	-2.899413275	-4.042701415	1978.791	-0.4	-4.26	9.06248
-4.523	1877	-4.83	1884	0.47	1996.775	3.72E-06	1988.42	9.4	26.28	-0.33	1928.58	-4.97	1976.91667	-2.816079348	-4.098973469	1978.625	-0.44	-3.93	9.10924
-4.476	1876	-4.82	1883	-0.03	1996.755	3.57E-06	1988.34	9.32	27.33	-0.34	1928.08	-5.15	1976.75	-2.601589645	-3.881222555	1978.458	-0.36	-4.03	9.07325
-4.6	1875	-5.06	1882	0.33	1996.735	3.42E-06	1988.25	9.3	27.55	-0.36	1927.58	-5.15	1976.58333	-2.96015608	-3.903490093	1978.291	0.13	-4.65	8.99986
-4.883	1874	-4.97	1881	1.21	1996.715	3.37E-06	1988.17	9.31	27.43	-0.37	1927.08	-5.15	1976.41667	-3.225678644	-4.136600817	1978.125	0.07	-4.71	8.90428
-5.075	1873	-5.14	1880	0.33	1996.695	3.49E-06	1988.09	9.37	26.76	-0.39	1926.58	-5.28	1976.25	-2.723082096	-4.132359953	1977.958	-0.57	-4.43	8.93728
-5.06	1872	-4.96	1879	0.73	1996.675	3.59E-06	1988	9.38	26.59	-0.41	1926.08	-4.9	1976.08333	-2.700192642	-4.355667593	1977.791	-0.45	-4.3	9.02902
-4.873	1871	-5.17	1878	0.15	1996.655	3.54E-06	1987.92	9.49	25.25	-0.42	1925.58	-5.3	1975.91667	-2.543742304	-4.026965738	1977.625	-0.92	-3.97	9.1603
-4.683	1870	-5.34	1877	1.04	1996.635	3.4E-06	1987.84	9.64	23.43	-0.44	1925.08	-5.36	1975.75	-2.658562616	-3.887313099	1977.458	-0.7	-4.3	9.008
-4.604	1869	-4.94	1876	0.41	1996.615	3.03E-06	1987.75	9.62	23.66	-0.45	1924.58	-4.84	1975.58333	-2.96660893	-3.836988809	1977.291	-0.69	-4.53	8.97027
-4.748	1868	-5.14	1875	2.3	1996.595	3.01E-06	1987.67	9.69	22.82	-0.47	1924.08	-5.33	1975.41667	-3.302221148	-4.281961307	1977.125	-0.41	-4.99	8.8937
-4.582	1867	-4.99	1874	-0.51	1996.575	3.33E-06	1987.59	9.63	23.55	-0.48	1923.58	-5.09	1975.25	-2.703985488	-4.187209337	1976.958	-0.03	-4.41	8.99597
-4.401	1866	-4.88	1873	0.74	1996.555	3.44E-06	1987.5	9.66	23.13	-0.5	1923.08	-5.01	1975.08333	-2.548399916	-3.993746047	1976.791	-0.16	-4.24	9.0661
-4.297	1865	-4.93	1872	-1.23	1996.535	3.67E-06	1987.42	9.64	23.4	-0.51	1922.58	-5.11	1974.91667	-2.484861587	-3.78531173	1976.625	-0.49	-3.71	9.1959
-4.232	1864	-5.01	1871	-0.24	1996.515	3.91E-06	1987.34	9.45	25.75	-0.52	1922.08	-5.14	1974.75	-2.838767528	-3.796762504	1976.458	-1.26	-4.08	9.06237
-4.354	1863	-4.87	1870	1.31	1996.495	3.69E-06	1987.25	9.37	26.68	-0.53	1921.58	-4.94	1974.58333	-3.589867882	-4.173740477	1976.291	-0.49	-4.74	8.90078
-4.538	1862	-4.9	1869	0.84	1996.475	3.79E-06	1987.17	9.37	26.7	-0.54	1921.08	-5.35	1974.41667	-3.124368414	-4.273095898	1976.125	-0.19	-4.89	8.94603
-4.823	1861	-4.98	1868	-0.72	1996.455	3.76E-06	1987.09	9.43	25.92	-0.56	1920.58	-5.09	1974.25	-2.771275183	-4.229629069	1975.958	-0.89	-4.76	9.07317
-4.757	1860	-4.8	1867	-0.66	1996.435	3.85E-06	1987	9.43	25.97	-0.57	1920.08	-5.48	1974.08333	-2.576776914	-3.960044687	1975.791	-0.82	-4.19	9.12518
-4.792	1859	-4.94	1866	-0.14	1996.415	3.94E-06	1986.92	9.49	25.25	-0.58	1919.58	-5.17	1973.91667	-2.388841389	-3.793375351	1975.625	-0.62	-3.88	9.1655
-4.755	1858	-4.9	1865	-0.58	1996.395	3.9E-06	1986.84	9.52	24.87	-0.59	1919.08	-5.09	1973.75	-2.895439805	-3.758303298	1975.458	-0.71	-4.14	9.11061
-4.732	1857	-5.09	1864	0.82	1996.375	3.86E-06	1986.75	9.55	24.57	-0.6	1918.58	-4.75	1973.58333	-3.783879099	-3.914602376	1975.291	-0.64	-4.44	9.02259
-4.649	1856	-4.83	1863	0.48	1996.355	4.07E-06	1986.67	9.57	24.27	-0.61	1918.08	-5.26	1973.41667	-3.391643846	-3.977386147	1975.125	-0.49	-4.8	8.8912
-4.569	1855	-4.75	1862	-0.01	1996.335	4.08E-06	1986.59	9.54	24.59	-0.62	1917.58	-5.08	1973.25	-2.895065476	-4.036190652	1974.958	-0.56	-4.57	8.94209
-4.518	1854	-4.8	1861	-0.35	1996.315	3.99E-06	1986.5	9.6	23.94	-0.63	1917.08	-5.34	1973.08333	-2.595667108	-4.12494692	1974.791	-0.47	-4.14	9.08181
-4.513	1853	-4.69	1860	-0.11	1996.295	3.76E-06	1986.42	9.48	25.37	-0.64	1916.58	-5.11	1972.91667	-2.483607468	-3.925047194	1974.625	-0.32	-3.87	9.1345
-4.459	1852	-4.66	1859	-0.17	1996.275	3.7E-06	1986.34	9.38	26.57	-0.64	1916.08	-5.46	1972.75	-2.795870904	-3.80592052	1974.458	-0.74	-4.21	9.07639
-4.648	1851	-4.59	1858	-1.53	1996.255	3.75E-06	1986.25	9.39	26.47	-0.65	1915.58	-4.9	1972.58333	-3.149811567	-3.840841087	1974.291	-0.53	-4.52	8.97349
-4.725	1850	-4.6	1857	-0.18	1996.235	3.96E-06	1986.17	9.32	27.31	-0.66	1915.08	-5.09	1972.41667	-3.386378096	-4.231312555	1974.125	-0.44	-4.98	8.8489
-4.74	1849	-4.56	1856	-0.37	1996.215	3.95E-06	1986.09	9.41	26.27	-0.67	1914.58	-4.92	1972.25	-2.791061066	-4.214344686	1973.958	-0.43	-4.51	8.9662
-4.854	1848	-4.87	1855	-1.19	1996.195	3.96E-06	1986	9.44	25.84	-0.68	1914.08	-5.22	1972.08333	-2.253295546	-4.025567433	1973.791	-0.25	-4.19	9.06307
-4.827	1847	-4.79	1854	-0.73	1996.175	3.98E-06	1985.92	9.49	25.19	-0.69	1913.58	-4.84	1971.91667	-2.227594089	-4.02872783	1973.625	-0.39	-3.82	9.1809
-4.834	1846	-4.53	1853	-1.07	1996.155	4.01E-06	1985.84	9.56	24.42	-0.69	1913.08	-4.91	1971.75	-2.279479753	-3.694830986	1973.458	-0.73	-4.16	
-4.839	1845	-4.59	1852	0.99	1996.135	4.05E-06	1985.75	9.67	23	-0.7	1912.58	-4.87	1971.58333	-2.924115082	-3.804099572	1973.291	-0.15	-4.7	

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1847	1.06	0.49	1858	-2.82	0.02	1973.083	-3.17	1496	-0.87	1570	9.784	0.055	1972.08	-0.66	-6	1862.5	-4.30188	1844	-3.7	1859	-4.362	1983.88
1846	-0.26	0.05	1857	-2.55	0.02	1972.917	-3.77	1493	-0.9	1567	9.698	0.012	1972	-0.8	-6.28	1862.67	-4.20817	1843	-4.03	1858	-4.309	1983.79
1845	-0.29	-0.31	1856	-2.81	0.01	1972.75	-3.81	1490	-0.91	1565	9.74	0.036	1971.92	-0.83	-6.44	1862.83	-4.10869	1842	-4.12	1857	-4.331	1983.71
1844	-0.59	-0.38	1855	-2.84	0.02	1972.583	-3.67	1486	-0.87	1562	9.646	0.058	1971.75	-0.78	-6.52	1863	-4.21637	1841	-4.04	1856	-4.371	1983.63
1843	-0.09	-0.22	1854	-2.64	0.04	1972.417	-3.53	1483	-0.78	1559	9.624	0.041	1971.65	-0.61	-6.4	1863.17	-4.32181	1840	-4.45	1855	-4.382	1983.54
1842	-0.11	-0.09	1853	-2.64	0.05	1972.25	-3.19	1480	-0.85	1555	9.592	0.039	1971.55	-0.23	-6.21	1863.33	-4.35807	1839	-4.05	1854	-4.353	1983.46
1841	-0.04	0.00	1852	-2.71	0.03	1972.083	-3	1477	-0.75	1551	9.65	0.028	1971.45	-0.14	-5.69	1863.5	-4.38232	1838	-4.23	1853	-4.352	1983.38
1840	0.29	-0.04	1851	-2.55	0.01	1971.917	-3.4	1475	-0.81	1547	9.611	0.025	1971.35	0.04	-5.66	1863.67	-4.44862	1837	-4.25	1852	-4.518	1983.29
1839	-0.79	-0.20	1850	-2.48	0.02	1971.75	-3.79	1472	-0.78	1545	9.701	0.048	1971.25	-0.16	-5.82	1863.83	-4.45629	1836	-3.95	1851	-4.366	1983.21
1838	0.56	-0.10	1849	-2.61	0.03	1971.583	-3.85	1469	-0.79	1542	9.68	0.067	1971.15	-0.22	-5.94	1864	-4.4169	1835	-3.81	1850	-4.286	1983.13
1837	-0.81	-0.26	1848	-2.6	0.02	1971.417	-3.7	1466	-0.72	1539	9.683	0.05	1971.05	-0.34	-6.19	1864.17	-4.38878	1834	-3.67	1849	-4.28	1983.04
1836	0.07	-0.13	1847	-2.64	0.03	1971.25	-3.63	1466	-0.77	1537	9.602	0.035	1970.95	-0.66	-6.32	1864.33	-4.40597	1833	-3.91	1848	-4.266	1982.96
1835	0.03	0.03	1846	-2.82	0.02	1971.083	-3.22	1463	-0.78	1535	9.667	0.095	1970.75	-0.87	-6.5	1864.5	-4.47467	1832	-4	1847	-4.205	1982.88
1834	0.06	0.07	1845	-2.84	0.04	1970.917	-3.29	1460	-0.78	1532	9.595	0.037	1970.65	-0.67	-6.16	1864.67	-4.57491	1831	-4.33	1846	-4.22	1982.79
1833	0.19	0.02	1844	-2.53		1970.75	-3.7	1457	-0.81	1529	9.691	0.034	1970.55	-0.59	-6.4	1864.83	-4.61168	1830	-4.25	1845	-4.257	1982.71
1832	-0.21	-0.35	1843	-2.61	0.03	1970.583	-3.85	1454	-0.8	1527	9.594	0.035	1970.45	-0.37	-6.2	1865	-4.49266	1829	-3.94	1844	-4.254	1982.63
1831	-1.19	-0.78	1842	-2.67	0.03	1970.417	-3.6	1451	-0.78	1524	9.626	0.014	1970.35	0.31	-5.75	1865.17	-4.50751	1828	-4.17	1843	-4.289	1982.54
1830	-0.62	-0.73	1841	-2.93		1970.25	-3.25	1447	-0.78	1520	9.683	0.035	1970.25	0.05	-5.56	1865.33	-4.58086	1827	-4.26	1842	-4.329	1982.46
1829	-0.63	-0.56	1840	-2.72		1970.083	-3.34	1447	-0.71	1517	9.642	0.084	1970.15	-0.09	-5.79	1865.5	-4.43084	1826	-3.99	1841	-4.273	1982.38
1828	-0.24	-0.49	1839	-2.79		1969.917	-3.7	1445	-0.72	1514	9.646	0.05	1970.05	-0.12	-6.04	1865.67	-4.39374	1825	-4.13	1840	-4.333	1982.29
1827	-0.85	-0.57	1838	-2.67	0.03	1969.75	-3.87	1445	-0.71	1510	9.758	0.003	1969.95	-0.62	-6.19	1865.83	-4.4209	1824	-4	1839	-4.332	1982.21
1826	-0.34	-0.42	1837	-2.62	0.02	1969.583	-3.93	1441	-0.67	1508	9.669	0.045	1969.85	-0.56	-6.34	1866	-4.49902	1823	-4.28	1838	-4.413	1982.13
1825	-0.25	-0.15	1836	-2.65	0.02	1969.417	-3.67	1438	-0.77	1508	9.664	0.036	1969.75	-0.45	-6.48	1866.17	-4.58318	1822	-3.86	1837	-4.204	1982.04
1824	0.33	0.05	1835	-2.48	0.02	1969.25	-3.24	1436	-0.77	1503	9.589	0.054	1969.67	-0.73	-6.1	1866.33	-4.60589	1821	-3.84	1836	-4.243	1981.96
1823	-0.16	-0.04	1834	-2.42	0.03	1969.083	-3.22	1433	-0.86	1500	9.658	0.046	1969.58	-0.68	-6.3	1866.5	-4.51013	1820	-4.04	1835	-4.426	1981.88
1822	-0.24	0.04	1833	-2.31	0.04	1968.917	-3.66	1430	-0.73	1496	9.698	0.046	1969.5	-0.79	-6.26	1866.67	-4.40483	1819	-4	1834	-4.419	1981.79
1821	0.82	0.26	1832	-2.18	0.04	1968.75	-3.89	1427	-0.83	1493	9.65	0.064	1969.42	-0.09	-5.98	1866.83	-4.30186	1818	-3.95	1833	-4.344	1981.71
1820	-0.27	0.00	1831	-2.6	0.03	1968.583	-3.77	1425	-0.78	1491	9.642	0.045	1969.33	0.17	-5.66	1867	-4.20944	1817	-4.02	1832	-4.375	1981.63
1819	-0.26	-0.14	1830	-2.67	0.03	1968.417	-3.48	1421	-0.81	1490	9.785	0.016	1969.25	-0.02	-5.23	1867.17	-4.22781	1816	-3.93	1831	-4.323	1981.54
1818	0.11	-0.03	1829	-2.53	0.02	1968.25	-3.11	1418	-0.73	1486	9.597	0.034	1969.17	-0.12	-5.44	1867.33	-4.28669	1815	-3.84	1830	-4.298	1981.46
1817	-0.02	-0.05	1828	-2.67	0.01	1968.083	-2.98	1416	-0.82	1483	9.569	0.048	1969.08	-0.68	-5.42	1867.5	-4.38435	1814	-3.78	1829	-4.29	1981.38
1816	-0.24	-0.18	1827	-2.64	0.02	1967.917	-3.4	1412	-0.82	1480	9.568	0.059	1969	-0.83	-5.58	1867.67	-4.41591	1813	-3.89	1828	-4.287	1981.29
1815	-0.21	-0.26	1826	-2.52	0.03	1967.75	-3.55	1409	-0.85	1477	9.669	0.023	1968.92	-0.94	-5.89	1867.83	-4.38243	1812	-3.79	1827	-4.168	1981.21
1814	-0.39	-0.40	1825	-2.48	0.03	1967.583	-3.94	1405	-0.76	1475	9.638	0.042	1968.83	-1.03	-6.01	1868	-4.33498	1811	-3.54	1826	-4.398	1981.13
1813	-0.56	-0.57	1824	-2.14	0.02	1967.417	-3.36	1402	-0.87	1472	9.577	0.021	1968.75	-0.55	-6.22	1868.17	-4.28517	1810	-3.67	1825	-4.424	1981.04
1812	-0.84	-0.66	1823	-2.91	0.03	1967.25	-3.1	1399	-0.76	1469	9.672	0.036	1968.65	0.22	-5.88	1868.33	-4.15045	1809	-3.97	1824	-4.38	1980.96
1811	-0.47	-0.52	1822	-2.56	0.02	1967.083	-3.2	1395	-0.92	1466	9.606	0.031	1968.55	0.29	-5.51	1868.5	-4.14559	1808	-3.81	1823	-4.479	1980.88
1810	-0.32	-0.31	1821	-2.83	0.03	1966.917	-3.64	1393	-0.79	1460	9.642	0.051	1968.45	0.78	-5.57	1868.67	-4.28901	1807	-4.09	1822	-4.472	1980.79
1809	-0.18	-0.02	1820	-2.71	0.03	1966.75	-3.85	1390	-0.83	1457	9.625	0.046	1968.35	0.44	-5.51	1868.83	-4.43928	1806	-3.69	1821	-4.302	1980.71
1808	0.63	0.27	1819	-2.72	0.06	1966.583	-3.82	1386	-0.82	1454	9.688	0.033	1968.25	0.62	-5.32	1869	-4.51587	1805	-3.69	1820	-4.25	1980.63
1807	0.11	0.16	1818	-2.64	0.02	1966.417	-3.65	1383	-0.85	1451	9.699	0.026	1968.15	-0.09	-5.81	1869.17	-4.44112	1804	-4	1819	-4.276	1980.54
1806	-0.13	-0.02	1817	-2.42	0.03	1966.25	-3.38	1380	-0.81	1447	9.687	0.041	1968.05	0.08	-5.49	1869.33	-4.29274	1803	-3.83	1818	-4.327	1980.46
1805	0.00	-0.04	1816	-2.47	0.03	1966.083	-3.17	1377	-0.86	1445	9.684	0.076	1967.95	-0.62	-6	1869.5	-4.23112	1802	-3.81	1817	-4.298	1980.38
1804	-0.06	-0.02	1815	-2.54	0.03	1965.917	-3.25	1372	-0.84	1441	9.699	0.036	1967.75	-0.77	-6.48	1869.67	-4.19245	1801	-4.03	1816	-4.1	1980.29
1803	0.08	-0.07	1814	-2.6	0.02	1965.75	-3.65	1369	-0.84	1438	9.67	0.051	1967.65	-0.91	-6.23	1869.83	-4.15843	1800	-4.29	1815	-4.208	1980.21

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.804	1844	-4.66	1851	-1.6	1996.115	4.15E-06	1985.67	9.61	23.81	-0.71	1912.08	-5.15	1971.41667	-2.942938846	-3.86088854	1973.125	0.17	-4.52	
-4.797	1843	-4.88	1850	-0.97	1996.095	4.27E-06	1985.59	9.62	23.71	-0.72	1911.58	-5.04	1971.25	-2.519937767	-3.912866702	1972.958	-0.46	-4.35	
-4.784	1842	-4.87	1849	-0.35	1996.075	4.46E-06	1985.5	9.61	23.79	-0.72	1911.08	-5.33	1971.08333	-2.362646572	-4.07858126	1972.791	-0.33	-4.12	
-4.771	1841	-4.89	1848	-0.4	1996.055	4.56E-06	1985.42	9.48	25.37	-0.73	1910.58	-4.98	1970.91667	-2.202908716	-3.888462615	1972.625	-0.22	-3.88	
-4.708	1840	-4.64	1847	-0.06	1996.035	4.79E-06	1985.34	9.46	25.64	-0.74	1910.08	-5.45	1970.75	-2.284244574	-3.622980663	1972.458	-0.54	-4.27	
-4.844	1839	-4.38	1846	0.79	1996.015	5.03E-06	1985.25	9.31	27.47	-0.74	1909.58	-5.28	1970.58333	-2.442504348	-3.606671729	1972.291	-0.38	-4.65	
-4.907	1838	-4.63	1845	-0.53	1995.995	4.65E-06	1985.17	9.36	26.83	-0.75	1909.08	-5.47	1970.41667	-3.448444802	-3.837111407	1972.125	-0.66	-4.82	
-4.989	1837	-4.67	1844	-0.88	1995.975	4.85E-06	1985.09	9.38	26.6	-0.75	1908.58	-5.47	1970.25	-3.169258357	-4.095184724	1971.958	-0.55	-4.3	
-4.989	1836	-4.84	1843	0.5	1995.955	4.62E-06	1985	9.41	26.23	-0.76	1908.08	-5.52	1970.08333	-2.562095683	-4.218421801	1971.791	-0.24	-4.07	
-4.887	1835	-4.69	1842	0.26	1995.935	4.76E-06	1984.92	9.43	25.98	-0.77	1907.58	-5.04	1969.91667	-2.476287042	-4.116427579	1971.625	-0.31	-3.93	
-4.816	1834	-4.64	1841	-0.13	1995.915	4.55E-06	1984.84	9.44	25.81	-0.77	1907.08	-5.3	1969.75	-2.609825387	-3.77483454	1971.458	-0.11	-4.38	
-4.863	1833	-4.7	1840	-0.31	1995.895	4.15E-06	1984.75	9.53	24.8	-0.78	1906.58	-5.31	1969.58333	-3.027746261	-3.734826395	1971.291	-0.29	-4.71	
-4.848	1832	-4.87	1839	0.23	1995.875	3.85E-06	1984.67	9.68	22.94	-0.78	1906.08	-5.05	1969.41667	-3.163584138	-4.056550272	1971.125	-0.37	-4.89	
-4.886	1831	-4.96	1838	-0.01	1995.855	3.76E-06	1984.59	9.65	23.28	-0.79	1905.58	-4.66	1969.25	-2.367373846	-4.11940292	1970.958	-0.65	-4.43	
-4.864	1830	-5.06	1837	0.05	1995.835	3.8E-06	1984.5	9.64	23.46	-0.79	1905.08	-5.21	1969.08333	-2.208263544	-4.018847874	1970.791	-0.54	-4.18	
-4.682	1829	-5.27	1836	-0.03	1995.815	3.9E-06	1984.42	9.62	23.73	-0.8	1904.58	-5.05	1968.91667	-2.599072208	-3.705611865	1970.625	-0.38	-4.01	
-4.608	1828	-4.94	1835	-0.48	1995.795	4.11E-06	1984.34	9.49	25.25	-0.8	1904.08	-5.32	1968.75	-2.972287989	-3.545528982	1970.458	-0.33	-4.08	
-4.67	1827	-5.15	1834	-0.57	1995.775	4.33E-06	1984.25	9.42	26.08	-0.8	1903.58	-5.12	1968.58333	-2.819582807	-3.550844449	1970.291	-0.53	-4.28	
-4.969	1826	-5	1833	0.07	1995.755	4.25E-06	1984.17	9.34	27.07	-0.81	1903.08	-5	1968.41667	-2.741551625	-3.782178	1970.125	-0.88	-4.75	
-5.156	1825	-4.96	1832	-0.76	1995.735	3.63E-06	1984.09	9.37	26.72	-0.81	1902.58	-4.87	1968.25	-2.706206901	-4.063043479	1969.958	-0.91	-4.36	
-5.025	1824	-4.81	1831	-0.81	1995.715	3.63E-06	1984	9.43	26	-0.81	1902.08	-4.9	1968.08333	-2.317070678	-4.07274731	1969.791	-0.72	-4	
-4.764	1823	-4.83	1830	-0.58	1995.695	3.67E-06	1983.92	9.45	25.73	-0.81	1901.58	-4.99	1967.91667	-2.160835582	-3.916856906	1969.625	-0.6	-3.92	
-4.727	1822	-4.8	1829	-0.79	1995.675	3.5E-06	1983.84	9.59	23.99	-0.82	1901.08	-5.32	1967.75	-2.416574821	-3.657469303	1969.458	-0.2	-4.38	
-4.716	1821	-4.64	1828	-0.48	1995.655	3.58E-06	1983.75	9.65	23.3	-0.82	1900.58	-4.98	1967.58333	-2.567824907	-3.692870149	1969.291	-0.12	-5.08	
-4.681	1820	-4.71	1827	-0.44	1995.635	3.58E-06	1983.67	9.69	22.82	-0.82	1900.08	-5.05	1967.41667	-2.727582176	-4.05682113	1969.125	0	-4.86	
-4.556	1819	-4.93	1826	0.87	1995.615	3.52E-06	1983.59	9.67	23.03	-0.81	1899.58	-4.97	1967.25	-2.930095459	-4.092606517	1968.958	-0.45	-4.22	
-4.481	1818	-4.81	1825	0.92	1995.595	3.68E-06	1983.5	9.59	24.07	-0.81	1899.08	-4.99	1967.08333	-2.460112539	-4.171592695	1968.791	-0.41	-4.03	
-4.436	1817	-4.88	1824	-0.53	1995.575	3.64E-06	1983.42	9.49	25.25	-0.81	1898.58	-5.33	1966.91667	-2.402034456	-4.161795411	1968.625	-0.72	-3.68	
-4.365	1816	-4.88	1823	-1.06	1995.555	3.62E-06	1983.34	9.44	25.81	-0.81	1898.08	-5.15	1966.75	-2.616163487	-3.699674259	1968.458	-0.32	-4.06	
-4.689	1815	-5.08	1822	-0.78	1995.536	3.68E-06	1983.25	9.42	26.06	-0.8	1897.58	-5.14	1966.58333	-3.129228879	-3.663946087	1968.291	-0.25	-4.52	
-4.923	1814	-5.13	1821	-1.33	1995.517	3.79E-06	1983.17	9.36	26.83	-0.8	1897.08	-5.12	1966.41667	-3.137310765	-4.025148604	1968.125	-0.54	-4.83	
-5.028	1813	-4.88	1820	-0.74	1995.497	3.82E-06	1983.09	9.42	26.08	-0.8	1896.58	-4.95	1966.25	-2.621380385	-4.043012853	1967.958	-0.66	-4.38	
-5.121	1812	-5.06	1819	0.85	1995.478	3.76E-06	1983	9.49	25.26	-0.79	1896.08	-5.07	1966.08333	-2.288547228	-4.060603479	1967.791	-0.66	-4.39	
-4.971	1811	-5.16	1818	-0.53	1995.459	3.71E-06	1982.92	9.54	24.6	-0.79	1895.58	-4.68	1965.91667	-2.410746067	-3.934977221	1967.625	-0.82	-3.98	
-4.726	1810	-5	1817	1.36	1995.44	3.72E-06	1982.84	9.65	23.28	-0.78	1895.08	-5.75	1965.75	-2.548684023	-3.656650355	1967.458	-0.96	-4.36	
-4.821	1809	-5.02	1816	-0.83	1995.42	3.67E-06	1982.75	9.68	22.94	-0.77	1894.58	-4.99	1965.58333	-2.98822863	-4.077328109	1967.291	-0.5	-4.93	
-4.862	1808	-4.95	1815	-0.87	1995.401	3.68E-06	1982.67	9.63	23.5	-0.77	1894.08	-5.4	1965.41667	-3.807619285	-4.149887169	1967.125	-0.34	-4.94	
-4.898	1807	-4.86	1814	2.09	1995.382	3.76E-06	1982.59	9.62	23.65	-0.76	1893.58	-5.05	1965.25	-3.054824206	-4.402766631	1966.958	-0.45	-4.46	
-4.775			1813	-0.05	1995.363	3.93E-06	1982.5	9.57	24.25	-0.75	1893.08	-5.45	1965.08333	-2.563091854	-4.35925638	1966.791	-0.33	-4.22	
-4.716			1812	0.01	1995.343	3.82E-06	1982.42	9.46	25.61	-0.74	1892.58	-5.12	1964.91667	-2.705303471	-3.976484974	1966.625	-0.63	-4.12	
-4.601			1811	1.41	1995.324	3.93E-06	1982.34	9.39	26.46	-0.74	1892.08	-5.31	1964.75	-2.795588974	-3.599900906	1966.458	-1.04	-4.35	
-4.692			1810	1.38	1995.305	4.04E-06	1982.25	9.32	27.29	-0.73	1891.58	-5.14	1964.58333	-3.300125283	-3.802497064	1966.291	-0.54	-4.57	
-4.783			1809	-0.27	1995.286	3.95E-06	1982.17	9.36	26.81	-0.72	1891.08	-5.46	1964.41667	-3.438622569	-3.832683032	1966.125	-0.51	-4.92	
-4.924			1808	-0.14	1995.267	3.82E-06	1982.09	9.35	27	-0.71	1890.58	-5.23	1964.25	-2.726958132	-3.883890546	1965.958	-0.56	-4.38	
-4.952			1807	0.36	1995.247	3.77E-06	1982	9.35	26.95	-0.7	1890.08	-5.48	1964.08333	-2.551068351	-4.018175024	1965.791	-0.71	-4.29	

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1802	-0.41	-0.18	1813	-2.59	0.02	1965.583	-3.81	1365	-0.86	1436	9.673	0.059	1967.55	-0.9	-6.05	1870	-4.13478	1799	-4.24	1814	-4.373	1980.13
1801	0.02	-0.13	1812	-2.59	0.02	1965.417	-3.8	1361	-0.83	1433	9.625	0.078	1967.45	-0.77	-6.2	1870.17	-4.25506	1798	-4.19	1813	-4.342	1980.04
1800	-0.21	-0.05	1811	-2.49	0.02	1965.25	-3.55	1356	-0.84	1430	9.754	0.038	1967.35	-0.36	-5.47	1870.33	-4.3614	1797	-3.83	1812	-4.25	1979.96
1799	0.20	0.12	1810	-2.55	0.02	1965.083	-3	1353	-0.86	1427	9.638	0.032	1967.25	-0.65	-5.51	1870.5	-4.34511	1796	-4.12	1811	-4.165	1979.88
1798	0.27	0.23	1809	-2.51	0.03	1964.917	-3.19	1348	-0.81	1425	9.599	0.118	1967.15	-0.1	-5.47	1870.67	-4.31095	1795	-4.34	1810	-4.122	1979.79
1797	0.30	0.16	1808	-2.61	0.02	1964.75	-3.7	1344	-0.85	1421	9.701	0.04	1967.05	-0.04	-5.38	1870.83	-4.30637	1794	-3.93	1809	-4.249	1979.71
1796	-0.21	-0.05	1807	-2.36	0.02	1964.583	-3.92			1418	9.765	0.12	1966.95	0	-6.03	1871	-4.28637	1793	-4.02	1808	-4.248	1979.63
1795	-0.10	-0.10	1806	-2.48	0.01	1964.417	-3.41			1416	9.698	0.089	1966.75	0.03	-6.23	1871.17	-4.28323	1792	-4.22	1807	-4.159	1979.54
1794	0.00	-0.17	1805	-2.47	0.01	1964.25	-3.17			1412	9.72	0.246	1966.67	-0.33	-6.14	1871.33	-4.29082	1791	-4.29	1806	-4.26	1979.46
1793	-0.59	-0.34	1804	-2.49	0.02	1964.083	-3.3			1409	9.741	0.042	1966.6	-0.34	-5.75	1871.5	-4.30428	1790	-4.17	1805	-4.294	1979.38
1792	-0.23	-0.29	1803	-2.3	0.04	1963.917	-3.8			1405	9.728	0.067	1966.52	-0.19	-5.99	1871.67	-4.32444	1789	-3.89	1804	-4.294	1979.29
1791	-0.19	-0.13	1802	-2.6	0.03	1963.75	-3.98			1402	9.682	0.043	1966.44	-0.02	-5.92	1871.83	-4.34878	1788	-3.95	1803	-4.182	1979.21
1790	0.17	-0.02	1801	-2.57	0.02	1963.583	-3.94			1399	9.621	0.022	1966.37	0.29	-5.73	1872	-4.32743	1787	-3.86	1802	-4.24	1979.13
1789	-0.22	-0.04	1800	-2.71	0.03	1963.417	-3.55			1395	9.673	0.021	1966.29	0.69	-5.63	1872.17	-4.31621	1786	-4.23	1801	-4.214	1979.04
1788	0.11	0.06	1799	-2.59	0.03	1963.25	-3.38			1393	9.723	0.05	1966.21	0.23	-5.64	1872.33	-4.28183	1785	-3.88			1978.96
1787	0.19	0.20	1798	-2.7	0.02	1963.083	-3.23			1390	9.556	0.089	1966.13	-0.1	-5.74	1872.5	-4.23535	1784	-3.99			1978.88
1786	0.34	0.25	1797	-2.85	0.06	1962.917	-3.55			1386	9.686	0.048	1966.06	-0.64	-5.89	1872.67	-4.22426	1783	-3.78			1978.79
1785	0.25	0.09	1796	-2.63	0.02	1962.75	-3.92			1383	9.683	0.088	1965.98	-0.32	-5.91	1872.83	-4.17612	1782	-4.01			1978.71
1784	-0.57	-0.06	1795	-2.75	0.02	1962.583	-3.97			1380	9.681	0.025	1965.9	-0.78	-6.3	1873	-4.18338	1781	-3.95			1978.63
1783	0.65	0.13	1794	-2.73	0.02	1962.417	-3.54			1377	9.615	0.034	1965.75	-0.8	-6.48	1873.17	-4.2017	1780	-3.98			1978.54
1782	-0.33	0.16	1793	-2.87	0.03	1962.25	-3.14			1372	9.675	0.074	1965.67	-0.98	-6.36	1873.33	-4.23011	1779	-4.26			1978.46
1781	0.87	0.15	1792	-2.44	0.02	1962.083	-2.93			1369	9.672	0.046	1965.58	-1.03	-6.39	1873.5	-4.25935	1778	-4.1			1978.38
1780	-0.88	-0.25	1791	-2.96	0.02	1961.917	-3.22			1365	9.639	0.032	1965.5	-0.94	-6.21	1873.67	-4.27286	1777	-3.74			1978.29
1779	-0.07	-0.31	1790	-2.58	0.02	1961.75	-3.73			1361	9.661	0.029	1965.42	0.16	-5.88	1873.83	-4.27585	1776	-4.04			1978.21
1778	-0.42	-0.18	1789	-2.37	0.04	1961.583	-4.05			1356	9.744	0.016	1965.33	0.4	-5.61	1874	-4.27394	1775	-3.96			1978.13
1777	0.24	0.01	1788	-2.48	0.01	1961.417	-3.44						1965.25	0.22	-5.24	1874.17	-4.20958	1774	-3.96			1978.04
1776	-0.01	-0.01				1961.25	-3.1						1965.17	-0.02	-5.69	1874.33	-4.35907	1773	-4.05			1977.96
1775	-0.27	-0.04				1961.083	-3.19						1965.08	-0.56	-5.87	1874.5	-4.58667	1772	-4.12			1977.88
1774	0.37	0.14				1960.917	-3.62						1965	-0.66	-6.18	1874.67	-4.49142	1771	-4.23			1977.79
1773	0.02	0.28				1960.75	-3.72						1964.92	-1.08	-6.36	1874.83	-4.33533	1770	-3.99			1977.71
1772	0.79	0.46				1960.583	-3.66						1964.75	-0.67	-6.39	1875	-4.34499	1769	-3.86			1977.63
1771	0.26	0.36				1960.417	-3.39						1964.68	-0.76	-6.24	1875.17	-4.39999	1768	-4.09			1977.54
1770	0.13	0.27				1960.25	-3.16						1964.61	-0.18	-6.16	1875.33	-4.4451	1767	-4.08			1977.46
1769	0.60	0.22				1960.083	-3.05						1964.54	-0.35	-6.19	1875.5	-4.54544	1766	-4.03			1977.38
1768	-0.46	-0.10				1959.917	-3.22						1964.46	0.07	-6.05	1875.67	-4.46839	1765	-3.82			1977.29
1767	-0.11	-0.12				1959.75	-3.38						1964.39	-0.37	-5.97	1875.83	-4.46201	1764	-3.98			1977.21
1766	0.15	-0.03				1959.583	-3.74						1964.32	-0.1	-5.88	1876	-4.50105	1763	-4.37			1977.13
1765	-0.24	-0.16				1959.417	-3.76						1964.25	-0.06	-5.8	1876.17	-4.46244	1762	-4.44			1977.04
1764	-0.26	-0.35				1959.25	-3.29						1964.18	-0.43	-5.78	1876.33	-4.39796	1761	-4.38			1976.96
1763	-0.69	-0.50				1959.083	-3.04						1964.11	-0.28	-5.96	1876.5	-4.37424	1760	-4.25			1976.88
1762	-0.45	-0.37				1958.917	-3.54						1964.04	-0.29	-6.1	1876.67	-4.36412	1759	-4			1976.79
1761	0.03	-0.01				1958.75	-3.63						1963.96	-0.51	-6.03	1876.83	-4.38455	1758	-4.17			1976.71
1760	0.37	0.27				1958.583	-3.78						1963.89	-0.27	-5.94	1877	-4.41515	1757	-4.1			1976.63
1759	0.42	0.30				1958.417	-3.8						1963.75	-0.94	-6.75	1877.17	-4.49888	1756	-3.85			1976.54
1758	-0.01	0.23				1958.25	-3.6						1963.67	-0.78	-6.57	1877.33	-4.6003	1755	-4.08			1976.46

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-5.085			1806	-0.08	1995.228	3.82E-06	1981.92	9.41	26.17	-0.69	1889.58	-5.24	1963.91667	-2.812191851	-3.932337679	1965.625	-0.68	-3.96	
-5.063			1805	-1.11	1995.209	3.81E-06	1981.84	9.48	25.43	-0.69	1889.08	-5.08	1963.75	-3.014785352	-3.857976352	1965.458	-0.73	-4.43	
-5.001			1804	-0.77	1995.19	3.81E-06	1981.75	9.58	24.11	-0.68	1888.58	-5.22	1963.58333	-3.599237215	-4.026674123	1965.291	-0.57	-4.88	
-4.925			1803	-0.78	1995.17	3.84E-06	1981.67	9.75	22.09	-0.67	1888.08	-5.58	1963.41667	-3.459324177	-4.409814854	1965.125	-0.53	-4.99	
-4.847			1802	0.28	1995.151	4.16E-06	1981.59	9.62	23.71	-0.66	1887.58	-4.98	1963.25	-2.629092097	-4.588504349	1964.958	-0.53	-4.6	
-4.73			1801	2.36	1995.132	4.27E-06	1981.5	9.58	24.15	-0.65	1887.08	-5.47	1963.08333	-2.791124555	-4.557786005	1964.791	-0.8	-4.36	
-4.523			1800	-0.81	1995.113	4.37E-06	1981.42	9.49	25.25	-0.64	1886.58	-5.13	1962.91667	-2.988954577	-4.077001014	1964.625	-0.92	-3.83	
-4.442			1799	-1.12	1995.093	4.18E-06	1981.34	9.45	25.78	-0.64	1886.08	-5.22	1962.75	-3.038989622	-3.845290047	1964.458	-0.88	-4.08	
-4.543			1798	0.09	1995.074	3.96E-06	1981.25	9.32	27.36	-0.63	1885.58	-5.02	1962.58333	-2.873852131	-3.800065896	1964.291	-0.43	-4.65	
-4.854			1797	-0.84	1995.055	3.99E-06	1981.17	9.3	27.55	-0.62	1885.08	-5.1	1962.41667	-3.496440274	-4.178775919	1964.125	-0.41	-4.95	
-5.06			1796	-0.51	1995.036	3.97E-06	1981.09	9.32	27.27	-0.61	1884.58	-4.91	1962.25	-2.467699655	-4.229204458	1963.958	-0.7	-4.49	
-5.096			1795	0.75	1995.017	3.93E-06	1981	9.41	26.26	-0.6	1884.08	-5.3	1962.08333	-2.644104583	-4.222523913	1963.791	-0.74	-4.27	
-5.075			1794	-0.58	1994.997	3.78E-06	1980.92	9.51	25	-0.59	1883.58	-4.68	1961.91667	-2.532638079	-3.989989531	1963.625	-0.96	-3.93	
-4.981			1793	-1.15	1994.978	3.93E-06	1980.84	9.63	23.54	-0.58	1883.08	-5.25	1961.75	-2.873832115	-3.724728869	1963.458	-0.86	-4.19	
-4.774			1792	-0.95	1994.959	4.25E-06	1980.75	9.49	25.29	-0.57	1882.58	-5.29	1961.58333	-3.076975368	-3.798903968	1963.291	-0.77	-4.62	
-4.766			1791	0.36	1994.94	4.08E-06	1980.67	9.6	23.86	-0.57	1882.08	-5.29	1961.41667	-3.173123314	-4.076621152	1963.125	-0.73	-4.99	
-4.778			1790	1.21	1994.92	3.71E-06	1980.59	9.68	23	-0.56	1881.58	-5.08	1961.25	-2.476917956	-4.245072708	1962.958	-0.75	-4.74	
-4.794			1789	-0.25	1994.901	3.67E-06	1980.5	9.62	23.65	-0.55	1881.08	-5.33	1961.08333	-2.252557097	-4.200082673	1962.791	-0.7	-4.39	
-4.638			1788	0.14	1994.882	3.71E-06	1980.42	9.57	24.27	-0.53	1880.58	-5.08	1960.91667	-2.872400223	-3.903222995	1962.625	-0.83	-4.16	
-4.594			1787	-0.1	1994.863	3.86E-06	1980.34	9.42	26.12	-0.52	1880.08	-5.25	1960.75	-2.651659705	-3.601605035	1962.458	-0.63	-4.6	
-4.825			1786	1.01	1994.843	3.73E-06	1980.25	9.23	28.4	-0.51	1879.58	-5.28	1960.58333	-3.180368911	-3.780956211	1962.291	-0.11	-4.82	
-4.976			1785	-0.68	1994.824	3.51E-06	1980.17	9.33	27.19	-0.5	1879.08	-5.47	1960.41667	-2.968526385	-3.989724906	1962.125	-0.13	-4.84	
-5.108			1784	-0.78	1994.805	3.49E-06	1980.09	9.4	26.33	-0.49	1878.58	-4.91	1960.25	-2.77653898	-3.802398792	1961.958	-0.35	-4.51	
-5.063			1783	-0.6	1994.786	3.54E-06	1980	9.56	24.38	-0.48	1878.08	-4.78	1960.08333	-2.558784678	-3.740965247	1961.791	-0.35	-4.41	
-5.006			1782	0.3	1994.767	3.75E-06	1979.92	9.56	24.36	-0.46	1877.58	-4.96	1959.91667	-2.520604248	-3.706354301	1961.625	-0.44	-4.21	
-4.884			1781	-2.01	1994.747	3.75E-06	1979.84	9.57	24.29	-0.45	1877.08	-4.93	1959.75	-2.279267967	-3.628094233	1961.458	-0.96	-4.35	
-4.895			1780	0.92	1994.728	3.67E-06	1979.75	9.61	23.81	-0.44	1876.58	-5	1959.58333	-3.115313355	-3.920656025	1961.291	-0.34	-4.67	
-4.982			1779	1.6	1994.709	3.65E-06	1979.67	9.58	24.1	-0.42	1876.08	-5.19	1959.41667	-3.258119647	-3.789843442	1961.125	-0.55	-5.01	
-4.957			1778	0.87	1994.69	3.86E-06	1979.59	9.49	25.28	-0.41	1875.58	-5.32	1959.25	-2.609845607	-4.296236724	1960.958	-0.55	-4.8	
-4.87			1777	-0.43	1994.67	3.87E-06	1979.5	9.46	25.55	-0.39	1875.08	-5.34	1959.08333	-2.44733518	-4.307498768	1960.791	-0.54	-4.39	
-4.709			1776	0.29	1994.651	3.45E-06	1979.42	9.39	26.41	-0.38	1874.58	-5.2	1958.91667	-2.463033603	-3.984114542	1960.625	-0.53	-4.07	
-4.615			1775	-0.2	1994.632	3.48E-06	1979.34	9.37	26.73	-0.36	1874.08	-4.89	1958.75	-2.666191099	-3.606608376	1960.458	-0.74	-4.24	
-4.725			1774	0.48	1994.613	3.65E-06	1979.25	9.37	26.7	-0.35	1873.58	-5.16	1958.58333	-3.217209211	-3.868690657	1960.291	-0.58	-4.69	
-4.878			1773	0.04	1994.593	3.59E-06	1979.17	9.33	27.19	-0.33	1873.08	-5.07	1958.41667	-3.471744224	-3.96783425	1960.125	-0.22	-4.81	
-5.094			1772	-0.53	1994.574	3.74E-06	1979.09	9.39	26.47	-0.32	1872.58	-5.32	1958.25	-3.064908813	-4.085444979	1959.958	-0.38	-4.59	
-5.088			1771	-0.31	1994.555	3.83E-06	1979	9.47	25.53	-0.3	1872.08	-5.08	1958.08333	-2.513461643	-4.339162973	1959.791	-0.27	-4.35	
-5.096			1770	-1.09	1994.538	3.82E-06	1978.92	9.52	24.88	-0.28	1871.58	-4.9	1957.91667	-2.353681926	-4.08211729	1959.625	-0.5	-4.25	
-5.132			1769	1.31	1994.521	3.94E-06	1978.84	9.54	24.59	-0.27	1871.08	-5.59	1957.75	-2.309648449	-3.731222927	1959.458	-0.84	-4.47	
-5.002			1768	0	1994.503	3.82E-06	1978.75	9.56	24.44	-0.25	1870.58	-5.08	1957.58333	-2.890817578	-3.842614244	1959.291	-0.59	-4.68	
-4.993			1767	-1.11	1994.486	3.88E-06	1978.67	9.64	23.42	-0.23	1870.08	-5.48	1957.41667	-2.89589979	-4.136345495	1959.125	-0.27	-5.11	
-4.877			1766	0.01	1994.469	3.99E-06	1978.59	9.6	23.9	-0.21	1869.58	-5.19	1957.25	-3.514408963	-4.032162709	1958.958	-0.63	-4.62	
-4.684			1765	2.64	1994.452	0.000004	1978.5	9.5	25.07	-0.19	1869.08	-5.12	1957.08333	-2.516395007	-4.178738678	1958.791	-0.55	-4.28	
-4.606			1764	-0.41	1994.434	3.89E-06	1978.42	9.44	25.79	-0.17	1868.58	-4.91	1956.91667	-2.304445683	-3.832360198	1958.625	-1.05	-4.2	
-4.565			1763	0.98	1994.417	3.91E-06	1978.34	9.42	26.14	-0.15	1868.08	-5.38	1956.75	-2.618769541	-3.404831443	1958.458	-0.78	-4.78	
-4.759			1762	1.03	1994.4	3.85E-06	1978.25	9.41	26.2	-0.13	1867.58	-5.11	1956.58333	-3.027220743	-3.620358741	1958.291	-0.55	-5.15	

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Lough, J. & Barnes, 2000		standard. Anoms ref'd to 1934-82 mean & SD	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
1757	0.55	0.23				1958.083	-3.37						1963.6	-0.91	-6.55	1877.5	-4.62482	1754	-4.13			1976.38
1756	-0.18	0.04				1957.917	-3.38						1963.52	-0.49	-6.54	1877.67	-4.6237	1753	-4.07			1976.29
1755	0.01	-0.04				1957.75	-3.83						1963.44	-0.49	-6.24	1877.83	-4.63717	1752	-3.99			1976.21
1754	-0.09	-0.01				1957.583	-3.89						1963.37	0.22	-5.91	1878	-4.65552	1751	-4.3			1976.13
1753	0.22	-0.04				1957.417	-3.69						1963.29	0.3	-5.69	1878.17	-4.64429	1750	-3.74			1976.04
1752	-0.52	-0.23				1957.25	-3.27						1963.21	0.71	-5.29	1878.33	-4.62871	1749	-4.26			1975.96
1751	-0.12	-0.20				1957.083	-2.94						1963.13	0.09	-5.61	1878.5	-4.55279	1748	-4.29			1975.88
1750	-0.08	-0.18				1956.917	-3.28						1963.06	0.1	-5.66	1878.67	-4.50021	1747	-4.13			1975.79
1749	-0.38	-0.29				1956.75	-3.86						1962.98	-0.46	-5.96	1878.83	-4.48815	1746	-4.01			1975.71
1748	-0.37	-0.29				1956.583	-4.03						1962.9	-0.51	-6.29	1879	-4.43643	1745	-3.95			1975.63
1747	-0.14	-0.07				1956.417	-3.47						1962.75	-0.75	-6.53	1879.17	-4.3296	1744	-4.25			1975.54
1746	0.43	0.13				1956.25	-2.97						1962.67	-0.68	-6.4	1879.33	-4.2197	1743	-3.84			1975.46
						1956.083	-2.99						1962.58	-0.95	-6.44	1879.5	-4.15031	1742	-4.1			1975.38
						1955.917	-3.46						1962.5	-0.4	-6.18	1879.67	-4.11816	1741	-4.24			1975.29
						1955.75	-3.67						1962.42	-0.18	-6.09	1879.83	-4.0324	1740	-4.06			1975.21
						1955.583	-3.74						1962.33	-0.31	-5.63	1880	-3.82874	1739	-4.13			1975.13
						1955.417	-3.45						1962.25	-0.06	-5.53	1880.17	-3.87437	1738	-3.94			1975.04
						1955.25	-3.4						1962.17	0.39	-5.46	1880.33	-4.02763	1737	-4.03			1974.96
						1955.083	-3.15						1962.08	0.34	-5.46	1880.5	-4.02522	1736	-4.1			1974.88
						1954.917	-3.24						1962	-0.22	-5.79	1880.67	-4.06261	1735	-4.12			1974.79
						1954.75	-3.6						1961.92	0.29	-6.02	1880.83	-4.12169	1734	-4.1			1974.71
						1954.583	-3.92						1961.75	0.18	-6.28	1881	-4.14014	1733	-4.39			1974.63
						1954.417	-3.55						1961.67	0.32	-6.2	1881.17	-4.14052	1732	-3.95			1974.54
						1954.25	-3.26						1961.6	-0.05	-6.14	1881.33	-4.13068	1731	-4.01			1974.46
						1954.083	-3.09						1961.52	0.2	-6.03	1881.5	-4.12211	1730	-3.93			1974.38
						1953.917	-3.59						1961.44	0.2	-5.94	1881.67	-4.1176	1729	-4.27			1974.29
						1953.75	-3.61						1961.37	0.25	-5.76	1881.83	-4.10549	1728	-4			1974.21
						1953.583	-3.77						1961.29	0.23	-5.76	1882	-4.08844	1727	-4.08			1974.13
						1953.417	-3.55						1961.21	0.2	-5.58	1882.17	-4.15022	1726	-4.06			1974.04
						1953.25	-3.32						1961.13	0.11	-5.74	1882.33	-4.23418	1725	-4.02			1973.96
						1953.083	-3.13						1961.06	0.04	-5.81	1882.5	-4.12269	1724	-4.08			1973.88
						1952.917	-3.55						1960.98	0.12	-5.85	1882.67	-3.96706	1723	-4.03			1973.79
						1952.75	-3.78						1960.9	0.33	-5.89	1882.83	-3.83881	1722	-4.08			1973.71
						1952.583	-3.89						1960.75	-0.04	-6.17	1883	-3.87486	1721	-4.29			1973.63
						1952.417	-3.54						1960.67	-0.06	-5.95	1883.17	-4.03926	1720	-4.06			1973.54
						1952.25	-3.19						1960.58	-0.35	-5.92	1883.33	-4.23891	1719	-4.13			1973.46
						1952.083	-2.95						1960.5	0.19	-5.95	1883.5	-4.27586	1718	-4.13			1973.38
						1951.917	-3.34						1960.42	-0.01	-5.89	1883.67	-4.24129	1717	-4.06			1973.29
						1951.75	-3.58						1960.33	0.11	-5.69	1883.83	-4.18512	1716	-4.04			1973.21
						1951.583	-3.73						1960.25	-0.22	-5.68	1884	-4.20207	1715	-4.17			1973.13
						1951.417	-3.52						1960.17	0.13	-5.62	1884.17	-4.25099	1714	-4.24			1973.04
						1951.25	-3.26						1960.08	-0.05	-5.77	1884.33	-4.2455	1713	-4.12			1972.96
						1951.083	-3.08						1960	-0.44	-6.01	1884.5	-4.21206	1712	-4.17			1972.88
						1950.917	-3.39						1959.92	-0.78	-6.38	1884.67	-4.1756	1711	-3.99			1972.79
						1950.75	-3.76						1959.75	-0.88	-6.43	1884.83	-4.15767	1710	-3.93			1972.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.994			1761	2.67	1994.383	3.85E-06	1978.17	9.35	26.95	-0.11	1867.08	-5.04	1956.41667	-2.936924294	-3.973436051	1958.125	-0.34	-5	
-5.082			1760	1.49	1994.365	3.97E-06	1978.09	9.38	26.54	-0.09	1866.58	-5.11	1956.25	-2.411717015	-4.149626075	1957.958	-0.84	-4.56	
-5.079			1759	1.07	1994.348	4.15E-06	1978	9.42	26.14	-0.07	1866.08	-4.8	1956.08333	-2.511735887	-4.064566108	1957.791	-0.65	-4.33	
-4.983			1758	1.63	1994.331	4.14E-06	1977.92	9.45	25.73	-0.05	1865.58	-4.71	1955.91667	-2.440305159	-3.65970743	1957.625	-0.9	-4.02	
-4.739			1757	1.17	1994.314	4.15E-06	1977.84	9.49	25.29	-0.03	1865.08	-4.75	1955.75	-2.792140966	-3.538351026	1957.458	-0.92	-4.6	
-4.727			1756	-0.4	1994.296	4.18E-06	1977.75	9.52	24.84	-0.01	1864.58	-4.73	1955.58333	-3.629005758	-3.876804551	1957.291	-0.4	-4.9	
-4.611			1755	0.68	1994.279	4.47E-06	1977.67	9.56	24.4	0.01	1864.08	-4.82	1955.41667	-2.974847254	-4.200686823	1957.125	-0.43	-4.68	
-4.586			1754	1.74	1994.262	4.94E-06	1977.59	9.51	24.97	0.04	1863.58	-4.81	1955.25	-2.488078809	-4.196676165	1956.958	-0.55	-4.44	
-4.562			1753	1.14	1994.245	4.58E-06	1977.5	9.44	25.83	0.06	1863.08	-4.26	1955.08333	-2.555923823	-3.984991407	1956.791	-0.5	-4.19	
-4.655			1752	-0.33	1994.227	4.14E-06	1977.42	9.35	27	0.08	1862.58	-4.63	1954.91667	-2.490733088	-3.727224589	1956.625	-0.71	-4.01	
-4.633			1751	-1.26	1994.21	4.05E-06	1977.34	9.31	27.4	0.1	1862.08	-4.61	1954.75	-2.945592589	-3.616339939	1956.458	-0.58	-4.53	
-4.715			1750	-0.09	1994.193	0.000004	1977.25	9.26	28.01	0.12	1861.58	-4.72	1954.58333	-3.380481704	-3.73517963	1956.291	-0.4	-5.08	
-4.845			1749	1.2	1994.176	3.9E-06	1977.17	9.3	27.61	0.14	1861.08	-5.03	1954.41667	-3.154317391	-3.806435665	1956.125	-0.61	-5.05	
-4.89			1748	0.12	1994.158	3.84E-06	1977.09	9.39	26.43	0.16	1860.58	-5	1954.25	-2.648796293	-3.923379032	1955.958	-0.45	-4.56	
-4.764			1747	0.47	1994.141	3.87E-06	1977	9.44	25.88	0.18	1860.08	-4.51	1954.08333	-2.283591139	-3.956806066	1955.791	-0.52	-4.21	
-4.744			1746	0.36	1994.124	3.87E-06	1976.92	9.48	25.33	0.19	1859.58	-4.89	1953.91667	-2.304493464	-3.61615113	1955.625	-0.62	-4.01	
-4.819			1745	-0.96	1994.107	4.2E-06	1976.84	9.49	25.21	0.21	1859.08	-4.75	1953.75	-2.832950282	-3.5925297	1955.458	-0.7	-4.25	
-4.795			1744	0.33	1994.089	4.18E-06	1976.75	9.47	25.43	0.23	1858.58	-5.17	1953.58333	-3.259357983	-3.685535249	1955.291	-0.08	-4.81	
-4.773			1743	0.07	1994.072	3.86E-06	1976.67	9.6	23.91	0.25	1858.08	-5.23	1953.41667	-3.728572559	-3.971487985	1955.125	-0.2	-4.98	
-4.738			1742	0.35	1994.055	3.8E-06	1976.59	9.51	24.98	0.27	1857.58	-5.09	1953.25	-3.145000112	-4.003843922	1954.958	-0.34	-4.61	
-4.723			1741	-0.71	1994.038	3.94E-06	1976.5	9.48	25.39	0.28	1857.08	-5.22	1953.08333	-2.854513937	-4.004320978	1954.791	-0.6	-4.11	
-4.673			1740	-0.53	1994.021	4.01E-06	1976.42	9.4	26.34	0.3	1856.58	-5.06	1952.91667	-2.409872572	-3.956544907	1954.625	-1.19	-3.93	
-4.679			1739	-0.44	1994.003	3.97E-06	1976.34	9.37	26.76	0.31	1856.08	-4.5	1952.75	-2.769314416	-3.757991731	1954.458	-0.96	-4.34	
-4.711			1738	-0.54	1993.986	3.81E-06	1976.25	9.32	27.34	0.33	1855.58	-4.76	1952.58333	-2.751152975	-3.725749735	1954.291	-0.66	-5	
-4.764			1737	-0.94	1993.969	3.84E-06	1976.17	9.31	27.43	0.34	1855.08	-4.7	1952.41667	-3.329092793	-3.952752149	1954.125	-0.52	-4.57	
-4.906			1736	0.79	1993.952	3.87E-06	1976.09	9.31	27.39	0.36	1854.58	-4.62	1952.25	-3.274977613	-4.282179604	1953.958	-0.6	-4.48	
-5.003			1735	-0.91	1993.934	3.71E-06	1976	9.35	26.99	0.37	1854.08	-4.71	1952.08333	-2.678976318	-4.176361735	1953.791	-0.69	-4.12	
-4.89			1734	0.53	1993.917	3.72E-06	1975.92	9.41	26.22	0.38	1853.58	-4.8	1951.91667	-2.457579627	-3.887788848	1953.625	-1	-3.8	
-4.795			1733	1.53	1993.9	3.7E-06	1975.84	9.45	25.79	0.4	1853.08	-4.34	1951.75	-2.200722927	-3.516776954	1953.458	-1.1	-4.53	
-4.752			1732	1.79	1993.883	3.59E-06	1975.75	9.47	25.49	0.41	1852.58	-4.43	1951.58333	-2.958713401	-3.636875321	1953.291	-0.88	-5.06	
-4.724			1731	2.71	1993.865	3.53E-06	1975.67	9.51	25	0.42	1852.08	-4.38	1951.41667	-3.296892789	-3.747025643	1953.125	-0.47	-5.01	
-4.781			1730	0.91	1993.848	3.63E-06	1975.59	9.45	25.75	0.43	1851.58	-4.77	1951.25	-2.787262916	-4.154034861	1952.958	-0.87	-4.6	
-4.743			1729	1.42	1993.831	3.78E-06	1975.5	9.38	26.54	0.43	1851.08	-4.51	1951.08333	-2.682398824	-3.991491309	1952.791	-0.8	-4.33	
-4.68			1728	-0.21	1993.814	3.76E-06	1975.42	9.34	27.09	0.44	1850.58	-4.31	1950.91667	-2.998565311	-3.786189937	1952.625	-1.55	-4.19	
-4.622			1727	-0.06	1993.796	3.73E-06	1975.34	9.32	27.33	0.45	1850.08	-4.75	1950.75	-3.008865524	-3.71952136	1952.458	-1.73	-4.36	
-4.76			1726	1.06	1993.779	3.65E-06	1975.25	9.3	27.55	0.45	1849.58	-4.13	1950.58333	-2.931501201	-3.773199731	1952.291	-0.81	-4.91	
-4.793			1725	0.47	1993.762	3.74E-06	1975.17	9.32	27.26	0.46	1849.08	-4.48	1950.41667	-3.549723724	-3.961615638	1952.125	-0.52	-4.97	
-4.909			1724	-0.61	1993.745	3.79E-06	1975.09	9.35	26.93	0.46	1848.58	-4.07	1950.25	-2.96460128	-4.051189619	1951.958	-0.12	-4.68	
-4.905			1723	-0.69	1993.727	3.79E-06	1975	9.39	26.41	0.47	1848.08	-4.27	1950.08333	-2.657391834	-4.019046403	1951.791	-0.35	-4.33	
-4.94			1722	0.84	1993.71	3.91E-06	1974.92	9.42	26.1	0.47	1847.58	-4.9	1949.91667	-2.731600639	-3.889891588	1951.625	-0.54	-3.78	
-4.948			1721	0.01	1993.693	3.81E-06	1974.84	9.43	26.03	0.47	1847.08	-4.21	1949.75	-2.671828215	-3.714966468	1951.458	-0.56	-4.11	
-4.876			1720	0.98	1993.676	3.74E-06	1974.75	9.45	25.71	0.47	1846.58	-4.83	1949.58333	-3.302750727	-4.135360445	1951.291	-0.48	-4.51	
-4.914			1719	-1.41	1993.658	3.86E-06	1974.67	9.51	25	0.47	1846.08	-4.39	1949.41667	-3.20939122	-4.097716495	1951.125	-0.27	-4.53	
-4.902			1718	0.98	1993.641	3.88E-06	1974.59	9.48	25.4	0.47	1845.58	-4.3	1949.25	-2.865329346	-4.269467231	1950.958	-0.44	-4.6	
-4.801			1717	0.78	1993.624	3.86E-06	1974.5	9.41	26.19	0.47	1845.08	-4.63	1949.08333	-2.558107489	-3.987536417	1950.791	-0.38	-4.33	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1950.583	-3.85						1959.68	-0.76	-6.31	1885	-4.16774	1709	-4.19			1972.63
						1950.417	-3.53						1959.61	-0.3	-6.29	1885.17	-4.21851	1708	-4.05			1972.54
						1950.25	-3.2						1959.54	-0.5	-6.14	1885.33	-4.28275	1707	-4.18			1972.46
						1950.083	-3.02						1959.46	-0.39	-6.15	1885.5	-4.31936	1706	-4.21			1972.38
						1949.917	-3.05						1959.39	-0.29	-6.07	1885.67	-4.31803	1705	-4.01			1972.29
						1949.75	-3.27						1959.32	-0.05	-5.72	1885.83	-4.32694	1704	-4.18			1972.21
						1949.583	-3.53						1959.25	0.11	-5.63	1886	-4.2504	1703	-4.5			1972.13
						1949.417	-3.61						1959.18	0.13	-5.7	1886.17	-4.20919	1702	-4.13			1972.04
						1949.25	-3.17						1959.11	-0.06	-5.73	1886.33	-4.25851	1701	-3.67			1971.96
						1949.083	-2.76						1959.04	-0.41	-5.88	1886.5	-4.23521	1700	-3.73			1971.88
						1948.917	-2.99						1958.96	-0.07	-6.13	1886.67	-4.17672	1699	-4			1971.79
						1948.75	-3.44						1958.89	-0.2	-6.3	1886.83	-4.11371	1698	-4.18			1971.71
						1948.583	-3.66						1958.75	-0.32	-6.4	1887	-4.10761	1697	-3.87			1971.63
						1948.417	-3.78						1958.67	-0.16	-6.08	1887.17	-4.12088	1696	-3.62			1971.54
						1948.25	-3.31						1958.6	-0.29	-5.92	1887.33	-4.13414	1695	-3.9			1971.46
						1948.083	-2.93						1958.52	-0.19	-6.13	1887.5	-4.19943	1694	-4.03			1971.38
						1947.917	-3.35						1958.44	0.18	-5.65	1887.67	-4.28206	1693	-3.99			1971.29
						1947.75	-3.61						1958.37	0.18	-5.53	1887.83	-4.37053	1692	-3.98			1971.21
						1947.583	-3.74						1958.29	0.18	-5.58	1888	-4.46676	1691	-3.85			1971.13
						1947.417	-3.58						1958.21	0.3	-5.63	1888.17	-4.56494	1690	-3.99			1971.04
						1947.25	-3.12						1958.13	-0.17	-5.86	1888.33	-4.52818	1689	-3.96			1970.96
						1947.083	-3.13						1958.06	-0.68	-6.09	1888.5	-4.48826	1688	-3.99			1970.88
						1946.917	-3.54						1957.98	-0.85	-6.45	1888.67	-4.60213	1687	-4.21			1970.79
						1946.75	-3.78						1957.9	-0.9	-6.53	1888.83	-4.76251	1686	-4.1			1970.71
						1946.583	-3.9						1957.75	-1.05	-6.56	1889	-4.80322	1685	-4.05			1970.63
						1946.417	-3.54						1957.66	-0.54	-6.37	1889.17	-4.5104	1684	-3.77			1970.54
						1946.25	-3.3						1957.57	-0.32	-6.27	1889.33	-4.4335	1683	-3.95			1970.46
						1946.083	-2.91						1957.48	-0.01	-6.14	1889.5	-4.32812	1682	-3.88			1970.38
						1945.917	-3.11						1957.39	0.32	-5.81	1889.67	-4.21669	1681	-4.06			1970.29
						1945.75	-3.48						1957.3	0.03	-5.9	1889.83	-4.1606	1680	-3.94			1970.21
						1945.583	-3.68						1957.2	-0.31	-5.87	1890	-4.09856	1679	-4.1			1970.13
						1945.417	-3.69						1957.11	-0.2	-5.95	1890.17	-4.14866	1678	-3.75			1970.04
						1945.25	-3.42						1957.02	-0.56	-5.99	1890.33	-4.27524	1677	-3.75			1969.96
						1945.083	-3.01						1956.93	-0.96	-6.35	1890.5	-4.2718	1676	-3.84			1969.88
						1944.917	-3.27						1956.75	-0.96	-6.43	1890.67	-4.24935	1675	-4.1			1969.79
						1944.75	-3.62						1956.66	-0.98	-6.23	1890.83	-4.20465	1674	-4.32			1969.71
						1944.583	-3.85						1956.57	-0.29	-5.94	1891	-4.21179	1673	-4.02			1969.63
						1944.417	-3.6						1956.48	0.12	-5.83	1891.17	-4.33086	1672	-4.15			1969.54
						1944.25	-3.16						1956.39	0.23	-5.73	1891.33	-4.42626	1671	-4.07			1969.46
						1944.083	-2.98						1956.3	0.36	-5.52	1891.5	-4.50364	1670	-4.31			1969.38
						1943.917	-3.51						1956.2	0.27	-5.6	1891.67	-4.48689	1669	-4.06			1969.29
						1943.75	-3.9						1956.11	-0.14	-5.73	1891.83	-4.4519	1668	-4.08			1969.21
						1943.583	-3.59						1956.02	-0.03	-5.79	1892	-4.41451	1667	-4.08			1969.13
						1943.417	-3.32						1955.93	-0.3	-5.94	1892.17	-4.3517	1666	-4.21			1969.04
						1943.25	-3.05						1955.75	-0.6	-6.17	1892.33	-4.27645	1665	-4.11			1968.96

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.687			1716	0.54	1993.607	3.98E-06	1974.42	9.41	26.22	0.46	1844.58	-4.24	1948.91667	-2.731554754	-3.720676269	1950.625	-0.37	-3.97	
-4.637			1715	0.06	1993.589	4.15E-06	1974.34	9.34	27.08	0.46	1844.08	-4.39	1948.75	-2.821646361	-3.67608596	1950.458	-0.92	-4.27	
-4.783			1714	0.54	1993.572	4.1E-06	1974.25	9.31	27.42	0.46	1843.58	-4.65	1948.58333	-3.026755179	-4.080821623	1950.291	-0.25	-4.76	
-4.813			1713	1.22	1993.555	4.13E-06	1974.17	9.26	28.04	0.45	1843.08	-4.99	1948.41667	-3.180636849	-4.239104689	1950.125	0.13	-4.96	
-4.845			1712	0.21	1993.539	4.09E-06	1974.09	9.28	27.82	0.44	1842.58	-4.83	1948.25	-2.704439177	-4.202031692	1949.958	-0.71	-4.7	
-4.788			1711	1.88	1993.523	4.06E-06	1974	9.29	27.64	0.44	1842.08	-4.8	1948.08333	-2.472011314	-4.06815143	1949.791	-0.25	-4.43	
-4.821			1710	-0.58	1993.507	4.05E-06	1973.92	9.37	26.7	0.43	1841.58	-4.37	1947.91667	-2.661171734	-4.094551895	1949.625	-0.63	-4.05	
-4.726			1709	0.06	1993.492	4.02E-06	1973.84	9.44	25.84	0.42	1841.08	-5.05	1947.75	-2.959301397	-3.763018386	1949.458	-0.76	-4.23	
-4.709			1708	0.1	1993.476	4.12E-06	1973.75	9.49	25.22	0.41	1840.58	-4.5	1947.58333	-2.680378739	-3.685451837	1949.291	-0.47	-4.58	
-4.672			1707	2.15	1993.46	4.01E-06	1973.67	9.52	24.88	0.4	1840.08	-4.48	1947.41667	-3.025118736	-3.871537689	1949.125	-0.55	-4.73	
-4.623			1706	1.05	1993.444	3.96E-06	1973.59	9.48	25.39	0.39	1839.58	-4.53	1947.25	-3.085662125	-4.111263302	1948.958	-0.29	-4.49	
-4.607			1705	2.43	1993.428	3.91E-06	1973.5	9.43	26.01	0.38	1839.08	-4.24	1947.08333	-2.416251497	-4.117488657	1948.791	-0.63	-4.28	
-4.484			1704	0.65	1993.412	3.97E-06	1973.42	9.38	26.63	0.37	1838.58	-4.38	1946.91667	-2.446131847	-3.990941034	1948.625	-0.49	-3.97	
-4.397			1703	1.27	1993.396	3.88E-06	1973.34	9.33	27.17	0.36	1838.08	-4.38	1946.75	-2.526937301	-3.698269652	1948.458	-0.83	-4.31	
-4.549			1702	0.32	1993.38	4.01E-06	1973.25	9.3	27.54	0.35	1837.58	-4.61	1946.58333	-3.017748176	-3.634622748	1948.291	-0.7	-4.72	
-4.724			1701	0.47	1993.365	3.99E-06	1973.17	9.33	27.23	0.34	1837.08	-4.57	1946.41667	-3.155824265	-4.110957491	1948.125	-0.25	-4.93	
-4.785			1700	-0.13	1993.349	3.93E-06	1973.09	9.39	26.46	0.33	1836.58	-4.52	1946.25	-2.779010108	-4.157441382	1947.958	-0.42	-4.77	
-4.846			1699	1.44	1993.333	3.94E-06	1973	9.47	25.47	0.32	1836.08	-4.78	1946.08333	-2.581673085	-4.017441474	1947.791	-0.58	-4.48	
-4.865			1698	0.65	1993.317	3.95E-06	1972.92	9.51	24.95	0.31	1835.58	-4.63	1945.91667	-2.860755639	-3.923537616	1947.625	-0.71	-3.9	
-4.777			1697	-0.15	1993.301	3.88E-06	1972.84	9.54	24.63	0.3	1835.08	-4.74	1945.75	-2.701955658	-3.697360815	1947.458	-0.88	-4.04	
-4.727			1696	1.35	1993.285	3.87E-06	1972.75	9.59	24.05	0.29	1834.58	-4.58	1945.58333	-3.586760494	-3.8460176	1947.291	-0.66	-4.71	
-4.721			1695	0.32	1993.269	3.94E-06	1972.67	9.57	24.32	0.28	1834.08	-5.16	1945.41667	-3.141141472	-4.231047463	1947.125	-0.41	-4.86	
-4.698			1694	-0.16	1993.253	4.08E-06	1972.59	9.53	24.74	0.27	1833.58	-4.16	1945.25	-2.894221095	-4.225333579	1946.958	-0.85	-4.35	
-4.704			1693	0.85	1993.238	4.19E-06	1972.5	9.49	25.23	0.26	1833.08	-4.58	1945.08333	-2.628121523	-4.019477424	1946.791	-0.27	-4.2	
-4.603			1692	-0.89	1993.222	4.15E-06	1972.42	9.42	26.07	0.25	1832.58	-4.75	1944.91667	-2.595133262	-3.8680927	1946.625	-0.65	-3.81	
-4.461			1691	1.4	1993.206	4.11E-06	1972.34	9.34	27.04	0.24	1832.08	-4.82	1944.75	-2.535822781	-3.697611091	1946.458	-0.48	-4.44	
-4.458			1690	0.01	1993.19	4.06E-06	1972.25	9.32	27.33	0.23	1831.58	-4.91	1944.58333	-2.596537782	-3.691655836	1946.291	-0.07	-4.79	
-4.667			1689	-1.74	1993.174	4.17E-06	1972.17	9.31	27.43	0.22	1831.08	-5.06	1944.41667	-2.598343459	-3.772905352	1946.125	-0.1	-4.79	
-4.957			1688	-1.01	1993.158	4.26E-06	1972.09	9.31	27.38	0.21	1830.58	-4.65	1944.25	-2.544720759	-3.860057276	1945.958	-0.31	-4.38	
-5.083			1687	-1.7	1993.142	4.08E-06	1972	9.36	26.85	0.21	1830.08	-5.12	1944.08333	-2.533150454	-3.93005429	1945.791	-0.25	-4.07	
-4.991			1686	0.5	1993.126	4.09E-06	1971.92	9.41	26.22	0.2	1829.58	-4.97	1943.91667	-2.567958753	-3.981131553	1945.625	-0.57	-3.73	
-4.835			1685	1.34	1993.111	4.17E-06	1971.84	9.51	24.99	0.19	1829.08	-5.25	1943.75	-2.264335625	-3.775901024	1945.458	-0.6	-4.33	
-4.834			1684	1.75	1993.095	4.11E-06	1971.75	9.53	24.76	0.18	1828.58	-5.14	1943.58333	-2.921405688	-3.81798718	1945.291	-0.47	-4.76	
-4.703			1683	-0.31	1993.079	4.18E-06	1971.67	9.57	24.27	0.17	1828.08	-5.04	1943.41667	-2.876321191	-3.935025377	1945.125	-0.4	-4.63	
-4.708			1682	-0.09	1993.063	4.16E-06	1971.59	9.5	25.17	0.16	1827.58	-4.81	1943.25	-2.647632593	-4.302103451	1944.958	-0.28	-4.41	
-4.565			1681	-0.83	1993.047	4.07E-06	1971.5	9.47	25.53	0.15	1827.08	-5.13	1943.08333	-2.73116374	-4.160546405	1944.791	-0.52	-4.02	
-4.443			1680	0.31	1993.031	3.86E-06	1971.42	9.4	26.32	0.14	1826.58	-5.18	1942.91667	-2.494355125	-3.932596233	1944.625	-0.82	-3.84	
-4.413			1679	1.6	1993.015	3.92E-06	1971.34	9.32	27.3	0.13	1826.08	-4.95	1942.75	-2.423824461	-3.70074719	1944.458	-0.59	-4.24	
-4.454			1678	0.76	1992.999	3.78E-06	1971.25	9.27	27.91	0.13	1825.58	-5.18	1942.58333	-3.117405707	-3.810401138	1944.291	-0.45	-4.8	
-4.681			1677	1.11	1992.984	3.72E-06	1971.17	9.32	27.31	0.12	1825.08	-5.18	1942.41667	-3.139521721	-4.00363744	1944.125	-0.44	-4.82	
-4.892			1676	1.55	1992.968	3.75E-06	1971.09	9.37	26.7	0.11	1824.58	-5.04	1942.25	-2.406298842	-4.127742008	1943.958	-0.52	-4.62	
-4.999			1675	1.16	1992.952	3.79E-06	1971	9.42	26.09	0.1	1824.08	-5.25	1942.08333	-2.374698401	-3.982339345	1943.791	-0.47	-4.36	
-4.881			1674	0.47	1992.936	3.67E-06	1970.92	9.49	25.31	0.09	1823.58	-4.36	1941.91667	-2.40415492	-3.569894971	1943.625	-0.41	-4.2	
-4.719			1673	3.12	1992.92	3.72E-06	1970.84	9.5	25.08	0.08	1823.08	-5.11	1941.75	-2.856298838	-3.568395756	1943.458	-0.67	-4.31	
-4.812			1672	0.87	1992.904	3.77E-06	1970.75	9.54	24.68	0.07	1822.58	-4.47	1941.58333	-2.995502241	-3.90947328	1943.291	-0.89	-4.73	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1943.083	-3.05						1955.68	-0.63	-6.17	1892.5	-4.21813	1664	-4.04			1968.88
						1942.917	-3.55						1955.62	-0.94	-6.13	1892.67	-4.15777	1663	-3.98			1968.79
						1942.75	-3.7						1955.55	-0.34	-5.64	1892.83	-4.16185	1662	-4.1			1968.71
						1942.583	-3.82						1955.48	-0.05	-6.23	1893	-4.26884	1661	-4.14			1968.63
						1942.417	-3.54						1955.42	0.27	-6.09	1893.17	-4.33362	1660	-4.12			1968.54
						1942.25	-3.24						1955.35	0.1	-5.79	1893.33	-4.33245	1659	-4.07			1968.46
						1942.083	-3.01						1955.28	0.06	-5.77	1893.5	-4.32159	1658	-4.23			1968.38
						1941.917	-3.09						1955.22	0.11	-5.68	1893.67	-4.35819	1657	-3.91			1968.29
						1941.75	-3.55						1955.15	0.14	-5.43	1893.83	-4.34853	1656	-3.96			1968.21
						1941.583	-3.87						1955.08	-0.13	-5.58	1894	-4.31771	1655	-3.79			1968.13
						1941.417	-3.9						1955.02	-0.33	-5.63	1894.17	-4.33077	1654	-3.98			1968.04
						1941.25	-3.78						1954.95	-0.27	-6.17	1894.33	-4.3397	1653	-4.12			1967.96
						1941.083	-3.22						1954.88	-0.47	-6.47	1894.5	-4.36677	1652	-4.27			1967.88
						1940.917	-3.34						1954.75	-0.29	-6.55	1894.67	-4.41132	1651	-4.01			1967.79
						1940.75	-3.75						1954.67	-0.19	-6.13	1894.83	-4.43025	1650	-3.9			1967.71
						1940.583	-3.79						1954.6	0.03	-6.04	1895	-4.441	1649	-3.61			1967.63
						1940.417	-3.57						1954.52	0.28	-5.73	1895.17	-4.42644	1648	-3.67			1967.54
						1940.25	-3.39						1954.44	0.34	-5.69	1895.33	-4.33622	1647	-4.06			1967.46
						1940.083	-3.45						1954.37	0.63	-5.73	1895.5	-4.2673	1646	-3.98			1967.38
						1939.917	-3.76						1954.29	0.39	-5.75	1895.67	-4.31308	1645	-3.73			1967.29
						1939.75	-4.03						1954.21	0.51	-5.74	1895.83	-4.41202	1644	-3.83			1967.21
						1939.583	-4.08						1954.13	0.14	-5.8	1896	-4.3151	1643	-4.01			1967.13
						1939.417	-3.74						1954.06	0.08	-5.88	1896.17	-4.06929	1642	-3.92			1967.04
						1939.25	-3.27						1953.98	-0.01	-6.01	1896.33	-3.94842	1641	-3.74			1966.96
						1939.083	-2.99						1953.9	0.09	-5.9	1896.5	-4.26695	1640	-3.94			1966.88
						1938.917	-3.37						1953.75	0.33	-6.13	1896.67	-4.54833	1639	-3.62			1966.79
						1938.75	-3.59						1953.67	0.17	-6.06	1896.83	-4.68395	1638	-3.58			1966.71
						1938.583	-3.85						1953.6	0.04	-5.89	1897	-4.61128	1637	-3.63			1966.63
						1938.417	-3.61						1953.52	0.29	-5.69	1897.17	-4.47912	1636	-3.97			1966.54
						1938.25	-3.28						1953.44	0.42	-5.64	1897.33	-4.34665	1635	-3.73			1966.46
						1938.083	-3.16						1953.37	0.39	-5.41	1897.5	-4.24547	1634	-3.99			1966.38
						1937.917	-3.34						1953.29	0.4	-5.4	1897.67	-4.20182	1633	-4.31			1966.29
						1937.75	-3.6						1953.21	0.58	-5.5	1897.83	-4.15575	1632	-4.05			1966.21
						1937.583	-3.8						1953.13	0.38	-5.7	1898	-4.09157	1631	-3.38			1966.13
						1937.417	-3.67						1953.06	-0.04	-5.98	1898.17	-3.94486	1630	-3.85			1966.04
						1937.25	-3.42						1952.98	-0.06	-6.14	1898.33	-3.75234	1629	-3.87			1965.96
						1937.083	-3.14						1952.9	-0.03	-6.6	1898.5	-4.0093	1628	-4.16			1965.88
						1936.917	-3.48						1952.75	0.28	-6.78	1898.67	-4.19866	1627	-4.01			1965.79
						1936.75	-3.69						1952.67	0.11	-6.43	1898.83	-4.26978	1626	-3.82			1965.71
						1936.583	-4						1952.6	0.35	-6.59	1899	-4.26099	1625	-3.77			1965.63
						1936.417	-3.62						1952.52	0	-6.5	1899.17	-4.31144	1624	-3.7			1965.54
						1936.25	-3.33						1952.44	0.34	-6.12	1899.33	-4.39381	1623	-4.32			1965.46
						1936.083	-3.26						1952.37	0.28	-5.92	1899.5	-4.55711	1622	-4.11			1965.38
						1935.917	-3.56						1952.29	0.39	-6.02	1899.67	-4.6504	1621	-4.27			1965.29
						1935.75	-3.83						1952.21	0.63	-5.8	1899.83	-4.71154	1620	-3.86			1965.21

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.86			1671	0.98	1992.888	3.74E-06	1970.67	9.53	24.76	0.06	1822.08	-5.2	1941.41667	-2.833538187	-4.060668578	1943.125	-0.61	-4.89	
-4.808			1670	1.19	1992.872	3.77E-06	1970.59	9.46	25.66	0.05	1821.58	-4.56	1941.25	-2.015091466	-3.874150499	1942.958	-0.63	-4.72	
-4.769			1669	0.04	1992.857	3.75E-06	1970.5	9.39	26.43	0.03	1821.08	-4.37	1941.08333	-2.176537138	-3.936341692	1942.791	-0.47	-4.26	
-4.679			1668	0.15	1992.841	3.78E-06	1970.42	9.37	26.7	0.02	1820.58	-4.43	1940.91667	-2.380417738	-3.847685337	1942.625	-0.94	-4.1	
-4.674			1667	1.04	1992.825	3.7E-06	1970.34	9.33	27.19	0.01	1820.08	-4.41	1940.75	-2.339292724	-3.488574733	1942.458	-1.17	-4.35	
-4.733			1666	-0.47	1992.809	3.82E-06	1970.25	9.33	27.19	0	1819.58	-4.6	1940.58333	-2.714838974	-3.638327862	1942.291	-0.82	-4.75	
-4.809			1665	0.24	1992.793	3.73E-06	1970.17	9.31	27.43	-0.01	1819.08	-5.07	1940.41667	-3.345463417	-3.90904471	1942.125	-0.38	-4.98	
-4.992			1664	-0.63	1992.777	3.71E-06	1970.09	9.39	26.47	-0.02	1818.58	-4.86	1940.25	-2.607697656	-3.976311959	1941.958	-0.3	-4.68	
-4.992			1663	1.17	1992.761	3.74E-06	1970	9.46	25.56	-0.03	1818.08	-4.71	1940.08333	-2.080537285	-4.121855897	1941.791	-0.58	-4.43	
-4.862			1662	1.7	1992.745	3.8E-06	1969.92	9.53	24.76	-0.04	1817.58	-4.91	1939.91667	-2.284579077	-4.034317906	1941.625	-0.81	-4.14	
-4.609			1661	0.51	1992.73	3.85E-06	1969.84	9.56	24.34	-0.06	1817.08	-4.91	1939.75	-2.33582234	-3.517277433	1941.458	-1	-4.37	
-4.598			1660	0.61	1992.714	3.89E-06	1969.75	9.6	23.96	-0.07	1816.58	-4.57	1939.58333	-3.39384648	-3.880786977	1941.291	-0.16	-4.68	
-4.73			1659	2.35	1992.698	3.92E-06	1969.67	9.63	23.55	-0.08	1816.08	-4.82	1939.41667	-3.245666114	-4.150931073	1941.125	-0.1	-4.8	
-4.814			1658	-0.09	1992.682	3.94E-06	1969.59	9.6	23.95	-0.09	1815.58	-4.72	1939.25	-2.443289094	-4.205459047	1940.958	-0.66	-4.7	
-4.788			1657	1.85	1992.666	3.95E-06	1969.5	9.51	25.03	-0.1	1815.08	-5.32	1939.08333	-2.547102979	-4.096250451	1940.791	-0.59	-4.26	
-4.715			1656	0.83	1992.65	3.94E-06	1969.42	9.39	26.4	-0.11	1814.58	-4.7	1938.91667	-2.37986239	-3.930282133	1940.625	-1.19	-4.08	
-4.558			1655	0.78	1992.634	4.18E-06	1969.34	9.36	26.85	-0.12	1814.08	-5.02	1938.75	-2.616412544	-3.605157822	1940.458	-0.85	-4.53	
-4.734			1654	-1.23	1992.618	3.59E-06	1969.25	9.32	27.33	-0.13	1813.58	-5.24	1938.58333	-3.038429457	-3.632959109	1940.291	-0.41	-5.06	
-4.929			1653	-0.4	1992.603	3.49E-06	1969.17	9.31	27.46	-0.15	1813.08	-4.81	1938.41667	-2.897150208	-4.035136706	1940.125	-0.74	-4.88	
-4.868			1652	-0.46	1992.587	3.29E-06	1969.09	9.35	26.92	-0.16	1812.58	-4.81	1938.25	-2.549881669	-4.07158158	1939.958	-0.68	-4.49	
-4.695			1651	-0.56	1992.571	3.39E-06	1969	9.39	26.45	-0.17	1812.08	-5.01	1938.08333	-2.514195071	-4.03295834	1939.791	-0.64	-4.28	
-4.634			1650	-1.3	1992.555	3.51E-06	1968.92	9.46	25.56	-0.18	1811.58	-5.25	1937.91667	-2.287495137	-3.672926446	1939.625	-0.84	-4.18	
-4.71			1649	0.68	1992.548	3.48E-06	1968.84	9.48	25.34	-0.2	1811.08	-5.18	1937.75	-2.580647175	-3.510726234	1939.458	-0.5	-4.47	
-4.775			1648	2.23	1992.541	3.57E-06	1968.75	9.53	24.81	-0.21	1810.58	-5.08	1937.58333	-3.18654862	-3.708249669	1939.291	-0.37	-5.14	
-4.829			1647	-0.82	1992.534	3.58E-06	1968.67	9.54	24.64	-0.22	1810.08	-4.99	1937.41667	-3.18934199	-4.020168558	1939.125	-0.07	-4.87	
-4.778			1646	-0.48	1992.527	3.71E-06	1968.59	9.53	24.77	-0.23	1809.58	-4.9	1937.25	-2.336800098	-3.897884815	1938.958	-0.52	-4.44	
-4.709			1645	-0.51	1992.521	3.81E-06	1968.5	9.51	24.97	-0.25	1809.08	-4.94	1937.08333	-2.225172562	-3.783111917	1938.791	-0.34	-4.63	
-4.713			1644	0.23	1992.514	3.94E-06	1968.42	9.47	25.49	-0.26	1808.58	-4.8	1936.91667	-2.510025094	-3.72655696	1938.625	-0.68	-4.04	
-4.651					1992.507	4.03E-06	1968.34	9.37	26.66	-0.27	1808.08	-4.66	1936.75	-2.883297708	-3.691953752	1938.458	-0.65	-4.15	
-4.848					1992.5	4.1E-06	1968.25	9.35	26.94	-0.29	1807.58	-4.83	1936.58333	-3.30203499	-3.762836617	1938.291	-0.67	-4.46	
-4.963					1992.493	4.13E-06	1968.17	9.35	26.91	-0.3	1807.08	-4.75	1936.41667	-3.102363828	-3.932152166	1938.125	-0.15	-4.65	
-5.046					1992.486	4.11E-06	1968.09	9.38	26.58	-0.32	1806.58	-4.82	1936.25	-2.661793519	-4.085508318	1937.958	-0.58	-4.45	
-4.976					1992.479	4.02E-06	1968	9.38	26.53	-0.33	1806.08	-4.99	1936.08333	-2.570496773	-4.117000705	1937.791	-0.64	-4.25	
-4.968					1992.472	4.05E-06	1967.92	9.43	25.96	-0.35			1935.91667	-2.765112459	-3.980484107	1937.625	-0.73	-3.76	
-4.895					1992.466	3.91E-06	1967.84	9.51	25.06	-0.36			1935.75	-2.978662971	-3.719711258	1937.458	-0.88	-3.92	
-4.85					1992.459	3.78E-06	1967.75	9.57	24.32	-0.38			1935.58333	-3.45468145	-3.891717233	1937.291	-0.77	-4.3	
-4.829					1992.452	3.81E-06	1967.67	9.58	24.15	-0.39			1935.41667	-3.112779859	-3.977694488	1937.125	-0.59	-4.57	
-4.867					1992.445	3.91E-06	1967.59	9.57	24.3	-0.4			1935.25	-2.15366809	-3.892129324	1936.958	-0.75	-4.95	
-4.802					1992.438	3.79E-06	1967.5	9.53	24.78	-0.42			1935.08333	-2.260037482	-3.966622244	1936.791	-0.54	-4.64	
-4.565					1992.431	3.82E-06	1967.42	9.53	24.82	-0.43			1934.91667	-2.240530291	-3.896155067	1936.625	-0.79	-4.09	
-4.532					1992.424	3.92E-06	1967.34	9.43	26.02	-0.45			1934.75	-2.608221956	-3.630190664	1936.458	-1.06	-4.26	
-4.591					1992.417	4.1E-06	1967.25	9.35	26.94	-0.46			1934.58333	-3.085731383	-3.652595071	1936.291	-1.04	-4.56	
-4.742					1992.41	3.94E-06	1967.17	9.35	26.92	-0.47			1934.41667	-3.286492401	-4.380868429	1936.125	-0.03	-4.89	
-4.903					1992.404	4.18E-06	1967.09	9.36	26.79	-0.49			1934.25	-2.992052535	-4.669671729	1935.958	-0.47	-4.76	
-4.953					1992.397	3.97E-06	1967	9.41	26.23	-0.5			1934.08333	-2.39714876	-4.35194721	1935.791	-0.54	-4.15	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1935.583	-3.9						1952.13	0.13	-5.91	1900	-4.7555	1619	-4.04			1965.13
						1935.417	-3.78						1952.06	-0.23	-6.34	1900.17	-4.79373	1618	-4.02			1965.04
						1935.25	-3.51						1951.98	-0.06	-6.31	1900.33	-4.69826	1617	-3.9			1964.96
						1935.083	-3.32						1951.9	-0.41	-6.4	1900.5	-4.55822	1616	-3.89			1964.88
						1934.917	-3.38						1951.75	-0.78	-6.73	1900.67	-4.41817	1615	-3.76			1964.79
						1934.75	-3.59						1951.67	-0.6	-6.59	1900.83	-4.1963	1614	-3.8			1964.71
						1934.583	-3.88						1951.58	-0.04	-6.37	1901	-3.95319	1613	-3.77			1964.63
						1934.417	-3.75						1951.5	0.24	-6.33	1901.17	-4.1791	1612	-3.88			1964.54
						1934.25	-3.34						1951.42	0.8	-5.56	1901.33	-4.40592	1611	-4.09			1964.46
						1934.083	-3.11						1951.33	0.34	-5.7	1901.5	-4.37753	1610	-4.12			1964.38
						1933.917	-3.35						1951.25	0.6	-5.56	1901.67	-4.38516	1609	-3.57			1964.29
						1933.75	-3.59						1951.17	0.55	-5.58	1901.83	-4.45235	1608	-3.94			1964.21
						1933.583	-3.81						1951.08	0.12	-5.81	1902	-4.3486	1607	-4.42			1964.13
						1933.417	-3.82						1951	-0.29	-6.18	1902.17	-4.38136					1964.04
						1933.25	-3.59						1950.92	-0.38	-6	1902.33	-4.54612					1963.96
						1933.083	-3.02						1950.75	-0.32	-6.16	1902.5	-4.70393					1963.88
						1932.917	-3.3						1950.66	-0.04	-5.87	1902.67	-4.78967					1963.79
						1932.75	-3.78						1950.57	0.34	-5.79	1902.83	-4.78047					1963.71
						1932.583	-4						1950.48	0.14	-5.66	1903	-4.71813					1963.63
						1932.417	-3.67						1950.39	-0.13	-5.63	1903.17	-4.60165					1963.54
						1932.25	-3.12						1950.3	0.01	-5.55	1903.33	-4.45413					1963.46
						1932.083	-2.89						1950.2	0.26	-5.39	1903.5	-4.43949					1963.38
						1931.917	-3.15						1950.11	0.11	-5.41	1903.67	-4.4716					1963.29
						1931.75	-3.52						1950.02	-0.13	-5.82	1903.83	-4.53184					1963.21
						1931.583	-3.84						1949.93	0.01	-6.23	1904	-4.45555					1963.13
						1931.417	-3.9						1949.75	-0.48	-6.36	1904.17	-4.34467					1963.04
						1931.25	-3.51						1949.68	-0.48	-6.07	1904.33	-4.31947					1962.96
						1931.083	-3.16						1949.62	-0.34	-5.82	1904.5	-4.36057					1962.88
						1930.917	-3.35						1949.55	-0.33	-5.94	1904.67	-4.61007					1962.79
						1930.75	-3.47						1949.48	0.25	-5.71	1904.83	-4.73072					1962.71
						1930.583	-3.66						1949.42	0.16	-5.68	1905	-4.77277					1962.63
						1930.417	-3.8						1949.35	0.42	-5.59	1905.17	-4.78512					1962.54
						1930.25	-3.36						1949.28	0.94	-5.3	1905.33	-4.73959					1962.46
						1930.083	-3.04						1949.22	0.27	-5.43	1905.5	-4.59016					1962.38
						1929.917	-3.16						1949.15	0	-5.69	1905.67	-4.60761					1962.29
						1929.75	-3.54						1949.08	-0.08	-5.97	1905.83	-4.5973					1962.21
						1929.583	-3.84						1949.02	-0.24	-5.93	1906	-4.48057					1962.13
						1929.417	-3.47						1948.95	-0.31	-6.02	1906.17	-4.40083					1962.04
						1929.25	-3						1948.88	-0.77	-5.96	1906.33	-4.38669					1961.96
						1929.083	-3.14						1948.75	-0.85	-6.17	1906.5	-4.27041					1961.88
						1928.917	-3.62						1948.64	-0.7	-6.08	1906.67	-4.2087					1961.79
						1928.75	-3.72						1948.53	0.42	-5.78	1906.83	-4.49424					1961.71
						1928.583	-3.93						1948.42	0.25	-5.65	1907	-4.46336					1961.63
						1928.417	-3.78						1948.31	0.39	-5.6	1907.17	-4.28981					1961.54
						1928.25	-3.1						1948.19	0.72	-5.27	1907.33	-4.20741					1961.46

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.827					1992.39	4.13E-06	1966.92	9.49	25.3	-0.51			1933.91667	-2.259618521	-4.082690856	1935.625	-1.02	-3.77	
-4.747					1992.383	4.12E-06	1966.84	9.56	24.36	-0.53			1933.75	-2.216128455	-3.404402867	1935.458	-1.29	-4.13	
-4.691					1992.376	3.98E-06	1966.75	9.59	23.99	-0.54			1933.58333	-2.885406089	-3.689849325	1935.291	-0.65	-4.22	
-4.689					1992.369	4.04E-06	1966.67	9.63	23.55	-0.55			1933.41667	-2.893186553	-3.971616991	1935.125	-0.61	-4.72	
-4.677					1992.362	4.15E-06	1966.59	9.6	23.88	-0.56			1933.25	-2.671988382	-4.004656861	1934.958	-0.71	-4.32	
-4.668					1992.355	4.23E-06	1966.5	9.54	24.63	-0.57			1933.08333	-2.636667845	-4.133670219	1934.791	-0.82	-4.09	
-4.622					1992.348	4.05E-06	1966.42	9.52	24.93	-0.58			1932.91667	-2.625765962	-3.829466915	1934.625	-1.2	-4.02	
-4.573					1992.342	4.05E-06	1966.34	9.47	25.51	-0.59			1932.75	-2.811625015	-3.567155024	1934.458	-1.31	-4.44	
-4.801					1992.335	3.94E-06	1966.25	9.41	26.17	-0.6			1932.58333	-3.36498482	-3.871223865	1934.291	-0.81	-4.77	
-5.013					1992.328	3.84E-06	1966.17	9.4	26.38	-0.61			1932.41667	-3.108176781	-4.000288542	1934.125	-0.41	-4.63	
-5.054					1992.321	3.75E-06	1966.09	9.42	26.12	-0.62			1932.25	-2.329169388	-4.386210652	1933.958	-0.53	-4.38	
-4.964					1992.314	3.89E-06	1966	9.44	25.87	-0.62			1932.08333	-2.203870854	-4.212610278	1933.791	-0.88	-4.21	
-4.88					1992.307	3.9E-06	1965.92	9.53	24.82	-0.63			1931.91667	-2.665189182	-3.776884389	1933.625	-1	-3.87	
-4.873					1992.3	3.84E-06	1965.84	9.59	23.99	-0.64			1931.75	-3.354351807	-3.641007189	1933.458	-1.5	-3.98	
-4.873					1992.293	3.66E-06	1965.75	9.62	23.72	-0.64			1931.58333	-3.390257364	-3.988557903	1933.291	-1.24	-4.38	
-4.786					1992.287	3.53E-06	1965.67	9.66	23.18	-0.65			1931.41667	-2.887761575	-3.90976276	1933.125	-0.29	-4.47	
-4.673					1992.28	3.74E-06	1965.59	9.59	24.08	-0.65			1931.25	-2.67318193	-3.915940388	1932.958	-0.39	-4.4	
-4.569					1992.273	3.5E-06	1965.5	9.55	24.46	-0.65			1931.08333	-2.135103524	-3.740997633	1932.791	-0.64	-4.26	
-4.561					1992.266	3.51E-06	1965.42	9.48	25.37	-0.66			1930.91667	-2.54029124	-3.7239435	1932.625	-0.98	-3.95	
-4.556					1992.259	3.36E-06	1965.34	9.43	25.95	-0.66			1930.75	-2.63289932	-3.648222312	1932.458	-1.06	-4.31	
-4.737					1992.252	3.56E-06	1965.25	9.4	26.29	-0.66			1930.58333	-2.998850724	-3.689330034	1932.291	-0.65	-4.61	
-4.83					1992.245	3.57E-06	1965.17	9.39	26.46	-0.66			1930.41667	-3.48738222	-3.901211451	1932.125	-0.18	-4.62	
-4.901					1992.238	3.75E-06	1965.09	9.43	26.04	-0.66			1930.25	-3.322418146	-4.130889782	1931.958	-0.37	-4.31	
-4.992					1992.231	3.91E-06	1965	9.4	26.32	-0.66			1930.08333	-2.774016476	-4.162305589	1931.791	-0.76	-4.13	
-4.943					1992.225	3.9E-06	1964.92	9.45	25.79	-0.66			1929.91667	-3.120166015	-3.936452158	1931.625	-1.36	-3.86	
-4.91					1992.218	3.87E-06	1964.84	9.48	25.33	-0.66			1929.75	-3.466315553	-3.710598727	1931.458	-1.33	-4.37	
-4.81					1992.211	3.9E-06	1964.75	9.54	24.66	-0.66			1929.58333	-3.039180143	-3.98115717	1931.291	-1.31	-4.91	
-4.681					1992.204	4.19E-06	1964.67	9.65	23.3	-0.66			1929.41667	-3.04898469	-4.131247743	1931.125	-1.28	-4.46	
-4.781					1992.197	4.19E-06	1964.59	9.62	23.61	-0.66			1929.25	-2.887417367	-3.995883092	1930.958	-1.26	-4.48	
-4.712					1992.19	3.92E-06	1964.5	9.54	24.66	-0.66			1929.08333	-2.682868946	-3.943572023	1930.791	-1.23	-4.1	
-4.581					1992.183	3.79E-06	1964.42	9.44	25.81	-0.66			1928.91667	-2.670519991	-3.76248317	1930.625	-1.21	-3.76	
-4.494					1992.176	3.74E-06	1964.34	9.38	26.62	-0.66			1928.75	-2.658171036	-3.581394317	1930.458	-1.18	-4.05	
-4.551					1992.17	3.5E-06	1964.25	9.32	27.31	-0.66			1928.58333	-2.941333926	-3.839181065	1930.291	-1.15	-4.59	
-4.772					1992.163	3.55E-06	1964.17	9.33	27.15	-0.66			1928.41667	-3.268507198	-3.837831973	1930.125	-1.13	-4.65	
-4.943					1992.156	3.6E-06	1964.09	9.41	26.27	-0.66			1928.25	-2.621459294	-4.090378015	1929.958	-1.1	-4.46	
-4.981					1992.149	3.57E-06	1964	9.52	24.87	-0.65			1928.08333	-2.413199105	-4.171029619	1929.791	-1.08	-4.24	
-4.918					1992.142	3.64E-06	1963.92	9.58	24.19	-0.65			1927.91667	-2.394512916	-3.96958034	1929.625	-1.05	-4.03	
-4.897					1992.135	3.56E-06	1963.84	9.6	23.87	-0.65			1927.75	-2.595958727	-3.699088166	1929.458	-0.91	-4.21	
-4.935					1992.128	3.61E-06	1963.75	9.62	23.64	-0.65			1927.58333	-3.121087946	-3.853088098	1929.291	-0.62	-4.72	
-4.846					1992.121	3.65E-06	1963.67	9.65	23.3	-0.64			1927.41667	-3.485551905	-4.221622963	1929.125	-0.34	-4.83	
-4.722					1992.114	3.68E-06	1963.59	9.59	24.06	-0.64			1927.25	-2.960128342	-4.198545651	1928.958	-0.61	-4.49	
-4.664					1992.108	3.81E-06	1963.5	9.57	24.28	-0.64			1927.08333	-2.570823741	-3.957608027	1928.791	-0.59	-4.17	
-4.644					1992.101	3.91E-06	1963.42	9.53	24.7	-0.63			1926.91667	-2.613857288	-3.899126798	1928.625	-1.4	-3.86	
-4.588					1992.094	3.89E-06	1963.34	9.47	25.43	-0.63			1926.75	-2.751313772	-3.606406269	1928.458	-0.89	-4.31	
-4.671					1992.087	3.91E-06	1963.25	9.37	26.65	-0.62			1926.58333	-3.199052071	-3.725208227	1928.291	-0.93	-4.15	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1928.083	-3.03						1948.08	0.32	-5.61	1907.5	-4.24956					1961.38
						1927.917	-3.5						1947.97	-0.36	-5.87	1907.67	-4.24452					1961.29
						1927.75	-3.67						1947.75	-0.33	-6.28	1907.83	-4.30876					1961.21
						1927.583	-3.53						1947.67	0.04	-6.1	1908	-4.24671					1961.13
						1927.417	-3.58						1947.6	-0.12	-6.12	1908.17	-4.07559					1961.04
						1927.25	-3.16						1947.52	0.31	-5.98	1908.33	-4.11484					1960.96
						1927.083	-2.87						1947.44	0.67	-5.64	1908.5	-4.19622					1960.88
						1926.917	-3.51						1947.37	0.85	-5.61	1908.67	-4.16891					1960.79
						1926.75	-3.68						1947.29	1.04	-5.34	1908.83	-4.10917					1960.71
						1926.583	-3.69						1947.21	0.9	-5.09	1909	-4.07321					1960.63
						1926.417	-3.61						1947.13	0.7	-5.43	1909.17	-4.04518					1960.54
						1926.25	-3.24						1947.06	0.51	-5.42	1909.33	-4.12696					1960.46
						1926.083	-3.01						1946.98	0.04	-5.92	1909.5	-4.30398					1960.38
						1925.917	-3.47						1946.9	-0.39	-6.3	1909.67	-4.44025					1960.29
						1925.75	-3.73						1946.75	-0.64	-6.47	1909.83	-4.41124					1960.21
						1925.583	-3.76						1946.67	0.03	-6.21	1910	-4.28219					1960.13
						1925.417	-3.61						1946.6	0	-6.36	1910.17	-4.17926					1960.04
						1925.25	-3.33						1946.52	0.31	-6.1	1910.33	-4.16669					1959.96
						1925.083	-3.22						1946.44	0.49	-6.12	1910.5	-4.19251					1959.88
						1924.917	-3.36						1946.37	0.32	-5.78	1910.67	-4.21126					1959.79
						1924.75	-3.67						1946.29	0.06	-5.66	1910.83	-4.10433					1959.71
						1924.583	-3.9						1946.21	0.63	-5.75	1911	-3.99453					1959.63
						1924.417	-3.44						1946.13	0.51	-5.79	1911.17	-4.35567					1959.54
						1924.25	-3.21						1946.06	0.24	-5.78	1911.33	-4.67118					1959.46
						1924.083	-3.09						1945.98	-0.31	-6.33	1911.5	-4.72251					1959.38
						1923.917	-3.57						1945.9	-0.42	-6.47	1911.67	-4.70723					1959.29
						1923.75	-3.75						1945.75	-0.46	-6.64	1911.83	-4.6891					1959.21
						1923.583	-3.84						1945.67	-0.72	-6.5	1912	-4.66116					1959.13
						1923.417	-3.77						1945.6	-0.7	-6.57	1912.17	-4.59663					1959.04
						1923.25	-3.43						1945.52	0	-6.18	1912.33	-4.52144					1958.96
						1923.083	-3.3						1945.44	0.5	-5.93	1912.5	-4.45985					1958.88
						1922.917	-3.75						1945.37	0.36	-5.72	1912.67	-4.48216					1958.79
						1922.75	-3.86						1945.29	0.41	-5.47	1912.83	-4.63754					1958.71
						1922.583	-3.76						1945.21	0.71	-5.22	1913	-4.7704					1958.63
						1922.417	-3.48						1945.13	0.69	-5.28	1913.17	-4.6246					1958.54
						1922.25	-3.36						1945.06	0.56	-5.46	1913.33	-4.41297					1958.46
						1922.083	-3.33						1944.98	0.42	-5.77	1913.5	-4.41849					1958.38
						1921.917	-3.52						1944.9	-0.02	-5.98	1913.67	-4.46774					1958.29
						1921.75	-3.63						1944.75	-0.18	-6.1	1913.83	-4.51701					1958.21
						1921.583	-3.58						1944.65	0.69	-5.62	1914	-4.6037					1958.13
						1921.417	-3.53						1944.55	0.53	-5.89	1914.17	-4.73364					1958.04
						1921.25	-3.27						1944.45	0.95	-5.76	1914.33	-4.85604					1957.96
						1921.083	-3.05						1944.35	0.96	-5.5	1914.5	-4.88834					1957.88
						1920.917	-3.49						1944.25	0.57	-5.42	1914.67	-4.87678					1957.79
						1920.75	-3.89						1944.15	0.72	-5.47	1914.83	-4.78199					1957.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.772					1992.08	3.84E-06	1963.17	9.38	26.56	-0.62			1926.41667	-3.222192137	-3.847166193	1928.125	-0.39	-4.66	
-4.842					1992.073	3.78E-06	1963.09	9.38	26.55	-0.61			1926.25	-2.689068229	-3.932891722	1927.958	-0.22	-4.4	
-4.922					1992.066	3.68E-06	1963	9.41	26.18	-0.61			1926.08333	-2.401758765	-3.996731778	1927.791	-0.44	-4.21	
-4.848					1992.059	3.8E-06	1962.92	9.47	25.51	-0.6			1925.91667	-2.571620803	-3.808092375	1927.625	-0.69	-3.81	
-4.864					1992.053	3.8E-06	1962.84	9.52	24.9	-0.6			1925.75	-2.644505924	-3.668003148	1927.458	-0.96	-4.07	
-4.802					1992.046	0.000004	1962.75	9.61	23.82	-0.59			1925.58333	-2.641081824	-3.634146634	1927.291	-1.03	-4.78	
-4.767					1992.039	3.79E-06	1962.67	9.66	23.18	-0.59			1925.41667	-2.728155138	-3.721588724	1927.125	-0.21	-4.76	
-4.726					1992.032	3.61E-06	1962.59	9.6	23.89	-0.59			1925.25	-2.543469212	-3.950797172	1926.958	-0.57	-4.54	
-4.646					1992.025	3.62E-06	1962.5	9.5	25.07	-0.58			1925.08333	-2.476069213	-4.056122902	1926.791	-0.62	-4.17	
-4.556					1992.018	3.38E-06	1962.42	9.46	25.65	-0.58			1924.91667	-2.57653157	-3.963092938	1926.625	-0.99	-3.81	
-4.436					1992.011	3.49E-06	1962.34	9.38	26.53	-0.57			1924.75	-2.70376584	-3.60296271	1926.458	-1.26	-4.07	
-4.566					1992.004	3.59E-06	1962.25	9.37	26.74	-0.57			1924.58333	-2.817926707	-3.606968813	1926.291	-0.25	-4.61	
-4.687					1991.997	3.91E-06	1962.17	9.4	26.34	-0.57			1924.41667	-2.333849677	-3.775698874	1926.125	-0.63	-4.99	
-4.838					1991.991	4.21E-06	1962.09	9.46	25.55	-0.56			1924.25	-3.041165336	-3.945929286	1925.958	-0.52	-4.71	
-4.925					1991.984	4.32E-06	1962	9.52	24.94	-0.56			1924.08333	-3.153332795	-4.190375728	1925.791	-0.61	-4.17	
-4.857					1991.977	4.4E-06	1961.92	9.55	24.49	-0.56			1923.91667	-2.675760836	-3.873110237	1925.625	-0.68	-3.84	
-4.715					1991.97	4.28E-06	1961.84	9.57	24.3	-0.56			1923.75	-2.82279058	-3.678351698	1925.458	-0.77	-4.42	
-4.643					1991.963	4.41E-06	1961.75	9.57	24.27	-0.56			1923.58333	-3.10815464	-3.684616004	1925.291	-0.45	-4.89	
-4.655					1991.956	4.49E-06	1961.67	9.57	24.27	-0.56			1923.41667	-3.14498419	-3.642764055	1925.125	-0.84	-4.93	
-4.68					1991.949	4.43E-06	1961.59	9.49	25.29	-0.56			1923.25	-2.547651171	-4.26932705	1924.958	-0.66	-4.42	
-4.619					1991.942	4.64E-06	1961.5	9.43	25.92	-0.56			1923.08333	-2.634659577	-4.012273645	1924.791	-0.68	-3.99	
-4.461					1991.935	4.65E-06	1961.42	9.37	26.68	-0.56			1922.91667	-2.387530408	-3.605664081	1924.625	-0.75	-3.84	
-4.404					1991.729	4.49E-06	1961.34	9.32	27.31	-0.56			1922.75	-3.001908104	-3.483792238	1924.458	-0.43	-4.4	
-4.579					1991.722	4.59E-06	1961.25	9.33	27.24	-0.57			1922.58333	-3.546611551	-3.702705948	1924.291	0.11	-4.76	
-4.744					1991.715	4.52E-06	1961.17	9.34	27.1	-0.57			1922.41667	-3.294603882	-3.961323654	1924.125	-0.32	-4.67	
-5.05					1991.708	4.35E-06	1961.09	9.32	27.27	-0.58			1922.25	-2.507757135	-4.057763862	1923.958	-0.63	-4.32	
-5.113					1991.701	4.26E-06	1961	9.39	26.4	-0.58			1922.08333	-3.133529018	-4.22309383	1923.791	-0.69	-4.22	
-5.02					1991.695	4.22E-06	1960.92	9.45	25.78	-0.59			1921.91667	-3.104115109	-4.18381247	1923.625	-0.68	-4	
-4.925					1991.688	4.06E-06	1960.84	9.51	25	-0.6			1921.75	-2.878795554	-3.941483593	1923.458	-0.75	-4.3	
-4.948					1991.681	3.84E-06	1960.75	9.57	24.32	-0.6			1921.58333	-3.366316264	-4.189762538	1923.291	-0.44	-4.73	
-4.806					1991.674	4.08E-06	1960.67	9.63	23.55	-0.61			1921.41667	-2.858866949	-4.38485098	1923.125	-0.52	-4.7	
-4.777					1991.667	4.19E-06	1960.59	9.59	24.02	-0.62			1921.25	-2.970098172	-4.298721638	1922.958	-0.56	-4.36	
-4.73					1991.66	4.02E-06	1960.5	9.51	24.96	-0.63			1921.08333	-2.393140301	-4.157812752	1922.791	-0.82	-4.31	
-4.683					1991.653	4.4E-06	1960.42	9.48	25.33	-0.64			1920.91667	-2.487371742	-4.043927276	1922.625	-0.86	-4.03	
-4.576					1991.646	4.63E-06	1960.34	9.42	26.12	-0.65			1920.75	-2.743408906	-3.713936479	1922.458	-0.85	-4.32	
-4.675					1991.639	4.54E-06	1960.25	9.36	26.77	-0.66			1920.58333	-3.47096386	-4.173371748	1922.291	-0.56	-4.78	
-4.759					1991.633	4.16E-06	1960.17	9.37	26.7	-0.66			1920.41667	-3.191017078	-4.299877374	1922.125	-0.5	-4.74	
-4.868					1991.626	4.25E-06	1960.09	9.4	26.31	-0.67			1920.25	-2.60939517	-4.087380474	1921.958	-0.44	-4.44	
-5.098					1991.619	4.13E-06	1960	9.43	25.96	-0.68			1920.08333	-2.463521315	-4.113750107	1921.791	-0.6	-4.11	
-5.12					1991.612	4.51E-06	1959.92	9.49	25.25	-0.69			1919.91667	-2.654581596	-3.878905828	1921.625	-0.9	-3.79	
-4.997					1991.605	4.08E-06	1959.84	9.56	24.42	-0.7			1919.75	-3.003957153	-3.703866758	1921.458	-0.7	-4.22	
-4.825					1991.598	3.97E-06	1959.75	9.63	23.58	-0.71			1919.58333	-3.909808887	-3.926640247	1921.291	-0.68	-4.86	
-4.677					1991.591	4.09E-06	1959.67	9.66	23.18	-0.71			1919.41667	-3.228029071	-3.994262881	1921.125	-0.97	-4.75	
-4.645					1991.584	4.04E-06	1959.59	9.61	23.84	-0.72			1919.25	-2.707127397	-3.974026608	1920.958	-1	-4.45	
-4.596					1991.578	4.29E-06	1959.5	9.57	24.26	-0.72			1919.08333	-2.462203465	-3.871811089	1920.791	-1.21	-4.16	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1920.583	-3.55						1944.05	0.7	-5.53	1915	-4.79976					1957.63
						1920.417	-3.29						1943.95	0.28	-6.24	1915.17	-4.85315					1957.54
						1920.25	-3.28						1943.75	-0.3	-6.49	1915.33	-4.77458					1957.46
						1920.083	-3.33						1943.68	-0.48	-6.21	1915.5	-4.63586					1957.38
						1919.917	-3.53						1943.61	-0.51	-6.04	1915.67	-4.48919					1957.29
						1919.75	-3.74						1943.54	-0.32	-6.08	1915.83	-4.38777					1957.21
						1919.583	-3.84						1943.46	0.31	-6.07	1916	-4.33945					1957.13
						1919.417	-3.92						1943.39	0.57	-5.93	1916.17	-4.33325					1957.04
						1919.25	-3.8						1943.32	0.68	-5.43	1916.33	-4.34299					1956.96
						1919.083	-3.42						1943.25	0.84	-5.6	1916.5	-4.29558					1956.88
						1918.917	-3.46						1943.18	0.3	-5.43	1916.67	-4.19434					1956.79
						1918.75	-3.65						1943.11	0.34	-5.51	1916.83	-4.10133					1956.71
						1918.583	-3.69						1943.04	0.08	-5.97	1917	-4.08162					1956.63
						1918.417	-3.47						1942.96	0	-6.08	1917.17	-4.10035					1956.54
						1918.25	-3.17						1942.89	-0.42	-6.1	1917.33	-4.13304					1956.46
						1918.083	-3.07						1942.75	-0.18	-6.12	1917.5	-4.18418					1956.38
						1917.917	-3.55						1942.67	0.17	-6.01	1917.67	-4.2631					1956.29
						1917.75	-3.83						1942.58	0.4	-5.97	1917.83	-4.34318					1956.21
						1917.583	-3.86						1942.5	0.32	-5.81	1918	-4.39145					1956.13
						1917.417	-3.56						1942.42	0.44	-5.69	1918.17	-4.40955					1956.04
						1917.25	-3.39						1942.33	0.24	-5.76	1918.33	-4.40999					1955.96
						1917.083	-3.32						1942.25	0.59	-5.64	1918.5	-4.6624					1955.88
						1916.917	-3.41						1942.17	0.48	-5.61	1918.67	-4.91493					1955.79
						1916.75	-3.65						1942.08	0.45	-5.71	1918.83	-4.96418					1955.71
						1916.583	-3.77						1942	0.31	-5.73	1919	-4.95512					1955.63
						1916.417	-3.7						1941.92	0.06	-6	1919.17	-4.94606					1955.54
						1916.25	-3.43						1941.75	0.01	-6.14	1919.33	-4.78502					1955.46
						1916.083	-3.3						1941.69	0.14	-6.05	1919.5	-4.65516					1955.38
						1915.917	-3.91						1941.63	-0.02	-5.88	1919.67	-4.91255					1955.29
						1915.75	-4.01						1941.57	0.03	-5.95	1919.83	-4.88849					1955.21
						1915.583	-3.93						1941.51	0.2	-5.78	1920	-4.67607					1955.13
						1915.417	-3.35						1941.46	0.05	-5.86	1920.17	-4.51898					1955.04
						1915.25	-3.14						1941.4	0.18	-5.75	1920.33	-4.52326					1954.96
						1915.083	-2.95						1941.34	0.17	-5.72	1920.5	-4.54124					1954.88
						1914.917	-3.25						1941.28	0.43	-5.43	1920.67	-4.51771					1954.79
						1914.75	-3.58						1941.22	0.31	-5.53	1920.83	-4.46431					1954.71
						1914.583	-3.54						1941.16	0.34	-5.59	1921	-4.39793					1954.63
						1914.417	-3.2						1941.1	0.41	-5.38	1921.17	-4.33269					1954.54
						1914.25	-3.01						1941.04	0.44	-5.57	1921.33	-4.27656					1954.46
						1914.083	-3.08						1940.99	-0.42	-5.84	1921.5	-4.37543					1954.38
						1913.917	-3.4						1940.93	-0.2	-5.9	1921.67	-4.44636					1954.29
						1913.75	-3.73						1940.87	-0.42	-5.81	1921.83	-4.48363					1954.21
						1913.583	-3.69						1940.75	-0.82	-6.2	1922	-4.4779					1954.13
						1913.417	-3.55						1940.67	-0.55	-6.04	1922.17	-4.47413					1954.04
						1913.25	-3.29						1940.6	-0.2	-5.93	1922.33	-4.47741					1953.96

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.602					1991.571	4.16E-06	1959.42	9.54	24.64	-0.72			1918.91667	-2.471660284	-3.782940338	1920.625	-1.51	-4.08	
-4.466					1991.564	4.36E-06	1959.34	9.45	25.68	-0.73			1918.75	-2.653995055	-3.753883148	1920.458	-0.87	-4.48	
-4.511					1991.557	4.17E-06	1959.25	9.4	26.32	-0.73			1918.58333	-3.179637128	-3.827700714	1920.291	-0.67	-4.99	
-4.72					1991.55	4.48E-06	1959.17	9.39	26.44	-0.73			1918.41667	-3.484183126	-4.24332178	1920.125	-0.86	-4.5	
-4.942					1991.541	4.43E-06	1959.09	9.49	25.26	-0.73			1918.25	-2.736188791	-4.368109495	1919.958	-1.08	-4.32	
-5.014					1991.531	4.41E-06	1959	9.63	23.59	-0.72			1918.08333	-2.369647403	-4.284181453	1919.791	-1.41	-4.13	
-5.108					1991.522	4.87E-06	1958.92	9.6	23.93	-0.72			1917.91667	-2.306849408	-4.130759458	1919.625	-1.33	-3.84	
-5.036					1991.513	4.9E-06	1958.84	9.63	23.53	-0.71			1917.75	-2.600132921	-3.693261658	1919.458	-0.86	-4.34	
-4.936					1991.503	4.84E-06	1958.75	9.66	23.23	-0.71			1917.58333	-3.587254925	-3.820411486	1919.291	-0.42	-4.49	
-4.818					1991.494	4.71E-06	1958.67	9.7	22.7	-0.7			1917.41667	-3.415628708	-3.92012525	1919.125	-0.35	-4.39	
-4.753					1991.485	5.04E-06	1958.59	9.61	23.82	-0.69			1917.25	-2.889479228	-4.056399901	1918.958	-0.47	-4.2	
-4.728					1991.475	5.08E-06	1958.5	9.56	24.39	-0.68			1917.08333	-2.732316095	-4.07096249	1918.791	-0.61	-4.04	
-4.712					1991.466	4.7E-06	1958.42	9.47	25.49	-0.66			1916.91667	-2.700600745	-3.651588435	1918.625	-1.17	-3.76	
-4.498					1991.457	4.71E-06	1958.34	9.42	26.05	-0.65			1916.75	-2.937076132	-3.602633498	1918.458	-1.3	-3.9	
-4.545					1991.447	4.88E-06	1958.25	9.43	26.02	-0.63			1916.58333	-3.549485333	-3.951392107	1918.291	-1.29	-4.12	
-4.713					1991.438	5.04E-06	1958.17	9.42	26.1	-0.62			1916.41667	-3.213808116	-4.021654284	1918.125	-1.1	-4.63	
-4.86					1991.429	5.06E-06	1958.09	9.47	25.43	-0.6			1916.25	-2.760261949	-3.845263555	1917.958	-1.58	-4.83	
-4.96					1991.419	5.17E-06	1958	9.53	24.82	-0.58			1916.08333	-2.442705396	-4.018135486	1917.791	-1.35	-4.4	
-4.982					1991.41	5.3E-06	1957.92	9.52	24.91	-0.56			1915.91667	-2.432140781	-4.06689499	1917.625	-1.11	-3.95	
-4.87					1991.4	5.23E-06	1957.84	9.51	25	-0.54			1915.75	-2.84016732	-3.804686899	1917.458	-1.72	-4.17	
-4.813					1991.391	5.01E-06	1957.75	9.56	24.42	-0.52			1915.58333	-3.67803382	-3.89911307	1917.291	-1.44	-4.6	
-4.825					1991.382	5.11E-06	1957.67	9.61	23.79	-0.5			1915.41667	-3.087000171	-4.0157057	1917.125	-1.24	-4.85	
-4.778					1991.372	5.48E-06	1957.59	9.58	24.15	-0.48			1915.25	-2.591676345	-4.232701645	1916.958	-1.41	-4.62	
-4.672					1991.363	5.82E-06	1957.5	9.53	24.81	-0.46			1915.08333	-2.694442229	-4.220710187	1916.791	-1.29	-4.19	
-4.742					1991.354	5.92E-06	1957.42	9.51	25.04	-0.43			1914.91667	-3.118215181	-3.607901639	1916.625	-1.44	-3.92	
-4.654					1991.344	5.93E-06	1957.34	9.42	26.13	-0.41			1914.75	-3.263129715	-3.395571533	1916.458	-1.25	-4.19	
-4.702					1991.335	5.52E-06	1957.25	9.34	27.03	-0.39			1914.58333	-2.945909054	-3.614864807	1916.291	-0.76	-4.67	
-4.84					1991.326	6.14E-06	1957.17	9.33	27.17	-0.37			1914.41667	-2.743029384	-4.084457013	1916.125	-0.69	-4.8	
-4.959					1991.316	5.95E-06	1957.09	9.33	27.18	-0.35			1914.25	-2.608431095	-3.86475637	1915.958	-1.34	-4.43	
-5.06					1991.307	6.32E-06	1957	9.35	26.96	-0.32			1914.08333	-2.455598213	-3.877185994	1915.791	-1.24	-4.13	
-5.125					1991.298	6.41E-06	1956.92	9.39	26.46	-0.3			1913.91667	-3.077133038	-3.677231116	1915.625	-1.15	-3.95	
-4.985					1991.288	6.11E-06	1956.84	9.44	25.81	-0.28			1913.75	-3.004169954	-3.524005079	1915.458	-1.2	-4.14	
-4.896					1991.279	5.37E-06	1956.75	9.51	25	-0.26			1913.58333	-3.406086446	-3.897283036	1915.291	-1.09	-4.61	
-4.86					1991.27	5.5E-06	1956.67	9.57	24.27	-0.24			1913.41667	-3.2791999	-3.969139878	1915.125	-0.24	-4.48	
-4.844					1991.26	6.1E-06	1956.59	9.52	24.87	-0.22			1913.25	-2.954376112	-3.764544165	1914.958	-0.79	-4.38	
-4.784					1991.251	6.48E-06	1956.5	9.5	25.12	-0.21			1913.08333	-2.553042326	-3.899759578	1914.791	-0.72	-4.2	
-4.676					1991.242	6.48E-06	1956.42	9.43	25.98	-0.19			1912.91667	-2.626578679	-4.083071947	1914.625	-1.18	-3.86	
-4.668					1991.232	7.03E-06	1956.34	9.34	27.09	-0.17			1912.75	-2.916374443	-3.667155215	1914.458	-1.34	-4.12	
-4.686					1991.223	9.25E-06	1956.25	9.35	26.99	-0.16			1912.58333	-3.221077283	-3.646620677	1914.291	-1.19	-4.34	
-4.789					1991.214	1.08E-05	1956.17	9.33	27.19	-0.14			1912.41667	-3.405577826	-3.918114191	1914.125	-0.41	-4.76	
-4.888					1991.204	1.37E-05	1956.09	9.34	27.04	-0.13			1912.25	-2.903076302	-3.99180496	1913.958	-0.99	-4.58	
-5.151					1991.195	1.17E-05	1956	9.4	26.31	-0.11			1912.08333	-2.303099743	-3.9308969	1913.791	-0.8	-4.14	
-5.078					1991.186	1.05E-05	1955.92	9.45	25.77	-0.1			1911.91667	-2.254305281	-3.855793285	1913.625	-1	-3.78	
-5.081					1991.176	8.91E-06	1955.84	9.49	25.26	-0.09			1911.75	-2.721181789	-3.641788694	1913.458	-1.25	-4.31	
-5.093					1991.167	9.09E-06	1955.75	9.54	24.66	-0.08			1911.58333	-3.096357444	-3.776795569	1913.291	-0.81	-4.6	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1913.083	-2.88						1940.52	-0.08	-5.64	1922.5	-4.44578					1953.88
						1912.917	-3.45						1940.44	0.3	-5.51	1922.67	-4.46148					1953.79
						1912.75	-3.62						1940.37	0.51	-5.41	1922.83	-4.41982					1953.71
						1912.583	-3.87						1940.29	0.48	-5.51	1923	-4.36609					1953.63
						1912.417	-3.66						1940.21	0.32	-5.16	1923.17	-4.36626					1953.54
						1912.25	-3.36						1940.13	0.03	-5.19	1923.33	-4.40012					1953.46
						1912.083	-3.04						1940.06	-0.4	-5.42	1923.5	-4.45264					1953.38
						1911.917	-3.26						1939.98	-0.83	-5.86	1923.67	-4.5219					1953.29
						1911.75	-3.59						1939.9	-0.87	-6.11	1923.83	-4.64324					1953.21
						1911.583	-3.87						1939.75	-0.86	-6.12	1924	-4.70459					1953.13
						1911.417	-3.57						1939.67	-0.77	-6.09	1924.17	-4.55225					1953.04
						1911.25	-3.13						1939.58	-0.88	-6.1	1924.33	-4.40876					1952.96
						1911.083	-3.08						1939.5	-0.56	-6.11	1924.5	-4.33926					1952.88
						1910.917	-3.48						1939.42	-0.68	-5.96	1924.67	-4.39817					1952.79
						1910.75	-3.7						1939.33	-0.13	-5.78	1924.83	-4.50216					1952.71
						1910.583	-3.79						1939.25	-0.07	-5.34	1925	-4.43064					1952.63
						1910.417	-3.31						1939.17	-0.24	-5.72	1925.17	-4.44553					1952.54
						1910.25	-2.95						1939.08	-0.36	-5.58	1925.33	-4.50902					1952.46
						1910.083	-3.03						1939	-0.45	-5.99	1925.5	-4.58066					1952.38
						1909.917	-3.39						1938.92	-0.98	-6.08	1925.67	-4.65909					1952.29
						1909.75	-3.69						1938.75	-1.1	-6.59	1925.83	-4.73119					1952.21
						1909.583	-3.8						1938.68	-1.28	-6.34	1926	-4.78537					1952.13
						1909.417	-3.68						1938.61	-1.06	-6.37	1926.17	-4.83443					1952.04
						1909.25	-3.25						1938.54	-0.76	-6.23	1926.33	-4.64094					1951.96
						1909.083	-2.9						1938.46	-0.4	-6.16	1926.5	-4.51263					1951.88
						1908.917	-3.18						1938.39	-0.08	-6.01	1926.67	-4.44858					1951.79
						1908.75	-3.48						1938.32	-0.04	-5.8	1926.83	-4.38748					1951.71
						1908.583	-3.83						1938.25	0.07	-5.61	1927	-4.31759					1951.63
						1908.417	-3.79						1938.18	-0.16	-5.64	1927.17	-4.21797					1951.54
						1908.25	-3.57						1938.11	-0.45	-5.89	1927.33	-4.20876					1951.46
						1908.083	-3.02						1938.04	-0.44	-6.11	1927.5	-4.36314					1951.38
						1907.917	-3.26						1937.96	-0.45	-6.31	1927.67	-4.39672					1951.29
						1907.75	-3.57						1937.89	-0.76	-6.41	1927.83	-4.38933					1951.21
						1907.583	-3.63						1937.75	-0.84	-6.66	1928	-4.48845					1951.13
						1907.417	-3.52						1937.68	-0.9	-6.46	1928.17	-4.3597					1951.04
						1907.25	-3.19						1937.62	-0.66	-6.47	1928.33	-4.32569					1950.96
						1907.083	-2.99						1937.55	-0.28	-6.3	1928.5	-4.34751					1950.88
						1906.917	-3.39						1937.48	-0.42	-6.1	1928.67	-4.36229					1950.79
						1906.75	-3.54						1937.42	-0.57	-6.34	1928.83	-4.37859					1950.71
						1906.583	-3.63						1937.35	-0.16	-6.34	1929	-4.36131					1950.63
						1906.417	-3.6						1937.28	-0.9	-6.36	1929.17	-4.34432					1950.54
						1906.25	-3.37						1937.22	-1.18	-6.18	1929.33	-4.34488					1950.46
						1906.083	-3.02						1937.15	-0.14	-6.01	1929.5	-4.41039					1950.38
						1905.917	-3.5						1937.08	-0.29	-5.73	1929.67	-4.49286					1950.29
						1905.75	-3.71						1937.02	-0.17	-5.55	1929.83	-4.55318					1950.21

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o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-5.04					1991.157	7.64E-06	1955.67	9.55	24.52	-0.07			1911.41667	-2.973493634	-3.928214854	1913.125	-0.54	-4.81	
-4.99					1991.148	6.11E-06	1955.59	9.5	25.17	-0.06			1911.25	-2.545982756	-4.057682546	1912.958	-0.47	-4.49	
-4.896					1991.139	6.35E-06	1955.5	9.44	25.83	-0.05			1911.08333	-2.145199865	-4.260289639	1912.791	-0.48	-4	
-4.863					1991.129	4.66E-06	1955.42	9.38	26.58	-0.04			1910.91667	-2.164700684	-4.062843006	1912.625	-1.09	-3.65	
-4.575					1991.12	3.97E-06	1955.34	9.32	27.28	-0.04			1910.75	-2.359689421	-3.611731323	1912.458	-1.15	-4.2	
-4.651					1991.111	3.89E-06	1955.25	9.31	27.41	-0.03			1910.58333	-2.670889696	-3.664785782	1912.291	-0.9	-4.47	
-4.926					1991.101	3.89E-06	1955.17	9.3	27.55	-0.02			1910.41667	-2.735688044	-3.929015357	1912.125	-0.66	-4.66	
-5.079					1991.092	3.97E-06	1955.09	9.31	27.43	-0.02			1910.25	-2.4644721	-4.227705454	1911.958	-0.38	-4.54	
-5.107					1991.083	3.85E-06	1955	9.42	26.1	-0.01			1910.08333	-2.505100279	-4.297171585	1911.791	-0.11	-4.03	
-5.079					1991.073	3.86E-06	1954.92	9.47	25.49	-0.01			1909.91667	-2.571498848	-3.97969814	1911.625	-0.45	-3.75	
-5.014					1991.064	3.67E-06	1954.84	9.51	25.03	-0.01			1909.75	-3.015135125	-3.641835467	1911.458	-0.8	-3.79	
-4.907					1991.055	3.58E-06	1954.75	9.54	24.66	0			1909.58333	-3.162777143	-4.017567772	1911.291	-0.49	-4.24	
-4.85					1991.045	3.89E-06	1954.67	9.54	24.64	0			1909.41667	-2.9989801	-4.146717743	1911.125	-0.38	-4.59	
-4.895					1991.036	3.67E-06	1954.59	9.52	24.86	0			1909.25	-2.62434299	-4.149717716	1910.958	-0.39	-4.58	
-4.848					1991.027	3.51E-06	1954.5	9.48	25.4	0.01			1909.08333	-2.181511233	-4.294621355	1910.791	-0.29	-4.24	
-4.754					1991.017	3.54E-06	1954.42	9.44	25.83	0.01			1908.91667	-2.086908956	-4.220718742	1910.625	-0.63	-3.91	9.28676
-4.634					1991.008	3.95E-06	1954.34	9.42	26.12	0.01			1908.75	-2.312829119	-3.72955875	1910.458	-0.31	-4	9.27244
-4.652					1990.999	4.22E-06	1954.25	9.38	26.6	0.02			1908.58333	-3.22144623	-3.758952551	1910.291	-0.14	-4.49	9.16543
-4.714					1990.989	4.55E-06	1954.17	9.37	26.66	0.02			1908.41667	-3.04573542	-3.874970105	1910.125	-0.23	-4.64	8.96573
-5.02					1990.98	3.58E-06	1954.09	9.41	26.19	0.02			1908.25	-2.631710373	-3.879923055	1909.958	-0.62	-4.53	9.09911
-5.119					1990.971	3.8E-06	1954	9.43	26	0.03			1908.08333	-2.716819986	-3.772695785	1909.791	-1.04	-4.4	9.08492
-5.133					1990.961	3.6E-06	1953.92	9.48	25.39	0.03			1907.91667	-2.466079297	-3.705555647	1909.625	-0.7	-4.05	9.23047
-5.145					1990.952	3.51E-06	1953.84	9.56	24.42	0.04			1907.75	-2.930260002	-3.676214457	1909.458	-0.5	-4.43	9.06911
-5.026					1990.943	3.66E-06	1953.75	9.6	23.96	0.04			1907.58333	-2.919837781	-4.001616407	1909.291	-0.02	-4.72	8.98661
-4.91					1990.933	3.58E-06	1953.67	9.61	23.79	0.05			1907.41667	-2.760451481	-4.304115437	1909.125	0.04	-4.93	8.91064
-4.725					1990.924	3.57E-06	1953.59	9.6	23.93	0.05			1907.25	-2.567212413	-4.101483313	1908.958	-0.17	-4.84	8.98198
-4.649					1990.914	3.56E-06	1953.5	9.55	24.53	0.06			1907.08333	-2.404435412	-3.991691129	1908.791	-0.32	-4.37	9.06894
-4.631					1990.905	3.38E-06	1953.42	9.45	25.76	0.06			1906.91667	-2.658039798	-3.708891975	1908.625	-0.63	-3.99	9.24025
-4.467					1990.896	3.58E-06	1953.34	9.37	26.7	0.07			1906.75	-3.019094933	-3.45882636	1908.458	-0.59	-4.31	9.13346
-4.669					1990.886	3.84E-06	1953.25	9.3	27.5	0.08			1906.58333	-3.131198159	-3.591175976	1908.291	-0.35	-4.61	8.94955
-4.837					1990.877	3.83E-06	1953.17	9.28	27.77	0.08			1906.41667	-2.790895626	-4.029891047	1908.125	0.1	-4.89	8.9127
-4.919					1990.868	3.95E-06	1953.09	9.28	27.8	0.09			1906.25	-2.389345155	-3.893806263	1907.958	-0.01	-4.61	9.06918
-4.906					1990.858	3.85E-06	1953	9.31	27.47	0.09			1906.08333	-2.374341885	-4.330005645	1907.791	-0.13	-4.18	9.20135
-4.826					1990.849	4.25E-06	1952.92	9.37	26.7	0.1			1905.91667	-2.696107305	-3.776435369	1907.625	-0.27	-3.61	9.30494
-4.73					1990.84	4.56E-06	1952.84	9.42	26.1	0.11			1905.75	-2.979726476	-3.467490056	1907.458	-0.56	-4.05	9.20248
-4.746					1990.83	3.69E-06	1952.75	9.49	25.25	0.11			1905.58333	-2.992597451	-3.714295898	1907.291	-0.69	-4.42	9.06712
-4.743					1990.821	3.88E-06	1952.67	9.57	24.27	0.12			1905.41667	-2.847926848	-3.890512544	1907.125	-0.22	-4.85	8.93683
-4.705					1990.812	3.96E-06	1952.59	9.54	24.59	0.12			1905.25	-2.61307277	-3.867542425	1906.958	0.1	-4.89	8.97504
-4.615					1990.802	4.03E-06	1952.5	9.55	24.51	0.13			1905.08333	-2.33755006	-3.869707672	1906.791	-0.31	-4.35	9.1118
-4.591					1990.793	4.11E-06	1952.42	9.48	25.33	0.13			1904.91667	-2.181280499	-4.066493961	1906.625	-0.39	-4.07	9.18703
-4.495					1990.784	4.09E-06	1952.34	9.42	26.12	0.14			1904.75	-2.512732928	-3.595773081	1906.458	-0.47	-4.3	9.1117
-4.648					1990.774	3.85E-06	1952.25	9.38	26.59	0.14			1904.58333	-3.051865973	-3.74632139	1906.291	-0.32	-4.79	9.05205
-4.811					1990.765	3.83E-06	1952.17	9.31	27.46	0.15			1904.41667	-2.861994136	-3.909225657	1906.125	0.02	-4.9	8.89131
-4.856					1990.756	3.71E-06	1952.09	9.33	27.19	0.15			1904.25	-2.012098658	-4.09712417	1905.958	-0.1	-4.38	9.1142
-4.87					1990.746	3.71E-06	1952	9.35	27	0.16			1904.08333	-2.264722305	-3.924411321	1905.791	-0.38	-4.24	9.18994

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1905.583	-3.86						1936.95	0.14	-5.51	1930	-4.67849					1950.13
						1905.417	-3.74						1936.88	0.3	-5.58	1930.17	-4.62235					1950.04
						1905.25	-3.35						1936.75	-0.86	-6.24	1930.33	-4.49772					1949.96
						1905.083	-3						1936.67	-0.76	-6.24	1930.5	-4.48055					1949.88
						1904.917	-3.23						1936.6	-0.25	-6.22	1930.67	-4.65588					1949.79
						1904.75	-3.61						1936.52	-0.4	-6.32	1930.83	-4.74731					1949.71
						1904.583	-3.7						1936.44	-0.03	-6.07	1931	-4.70321					1949.63
						1904.417	-3.48						1936.37	0.15	-5.51	1931.17	-4.59529					1949.54
						1904.25	-3.2						1936.29	-0.33	-5.76	1931.33	-4.48639					1949.46
						1904.083	-3.1						1936.21	0.09	-5.66	1931.5	-4.39323					1949.38
						1903.917	-3.2						1936.13	0.31	-5.51	1931.67	-4.32128					1949.29
						1903.75	-3.4						1936.06	-0.19	-5.52	1931.83	-4.32005					1949.21
						1903.583	-3.62						1935.98	-0.92	-6.22	1932	-4.28307					1949.13
						1903.417	-3.64						1935.9	-0.77	-6.49	1932.17	-4.34852					1949.04
						1903.25	-3.42						1935.75	-0.97	-6.62	1932.33	-4.36982					1948.96
						1903.083	-3.24						1935.67	-0.54	-6.28	1932.5	-4.34327					1948.88
						1902.917	-3.31						1935.6	-0.34	-6.17	1932.67	-4.35166					1948.79
						1902.75	-3.48						1935.52	-0.15	-5.92	1932.83	-4.41127					1948.71
						1902.583	-3.72						1935.44	-0.11	-5.67	1933	-4.39008					1948.63
						1902.417	-3.77						1935.37	0.16	-5.37	1933.17	-4.37639					1948.54
						1902.25	-3.37						1935.29	0.34	-5.32	1933.33	-4.36145					1948.46
						1902.083	-3.2						1935.21	0.2	-5.45	1933.5	-4.29183					1948.38
						1901.917	-3.47						1935.13	0.13	-5.45	1933.67	-4.29102					1948.29
						1901.75	-3.64						1935.06	-0.08	-5.76	1933.83	-4.27019					1948.21
						1901.583	-3.77						1934.98	-0.53	-6.16	1934	-4.20916					1948.13
						1901.417	-3.77						1934.9	-0.13	-6.12	1934.17	-4.3155					1948.04
						1901.25	-3.28						1934.75	-1.04	-6.27	1934.33	-4.38823					1947.96
						1901.083	-3.01						1934.69	-0.77	-6.11	1934.5	-4.41121					1947.88
						1900.917	-3.32						1934.63	-0.85	-6.15	1934.67	-4.41809					1947.79
						1900.75	-3.64						1934.57	-0.35	-5.93	1934.83	-4.42198					1947.71
						1900.583	-3.76						1934.51	-0.62	-6.39	1935	-4.42559					1947.63
						1900.417	-3.25						1934.46	0.08	-5.53	1935.17	-4.41741					1947.54
						1900.25	-3.01						1934.4	0.42	-5.48	1935.33	-4.39247					1947.46
						1900.083	-2.99						1934.34	0.37	-5.48	1935.5	-4.38475					1947.38
						1899.917	-3.41						1934.28	0.26	-5.35	1935.67	-4.40707					1947.29
						1899.75	-3.66						1934.22	-0.38	-5.4	1935.83	-4.45997					1947.21
						1899.583	-3.78						1934.16	-0.04	-5.32	1936	-4.46681					1947.13
						1899.417	-3.57						1934.1	-0.34	-5.77	1936.17	-4.45449					1947.04
						1899.25	-3.22						1934.04	-0.39	-5.96	1936.33	-4.45751					1946.96
						1899.083	-2.96						1933.99	-1.03	-6.15	1936.5	-4.4788					1946.88
						1898.917	-3.28						1933.93	-1.08	-6.1	1936.67	-4.49025					1946.79
						1898.75	-3.77						1933.87	-1.04	-6.19	1936.83	-4.48191					1946.71
						1898.583	-3.64						1933.75	-0.76	-6.28	1937	-4.46323					1946.63
						1898.417	-3.54						1933.66	-0.65	-6.23	1937.17	-4.42395					1946.54
						1898.25	-3.13						1933.57	-0.62	-6.14	1937.33	-4.40731					1946.46

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.812					1990.737	3.66E-06	1951.92	9.41	26.22	0.16			1903.91667	-2.704170334	-3.638494081	1905.625	-0.65	-4.1	9.26532
-4.707					1990.728	3.73E-06	1951.84	9.46	25.57	0.16			1903.75	-2.834359004	-3.537942734	1905.458	-0.4	-4.52	9.21719
-4.793					1990.718	3.6E-06	1951.75	9.57	24.27	0.17			1903.58333	-3.044994687	-3.724717318	1905.291	-0.29	-4.7	9.04367
-4.77					1990.709	3.65E-06	1951.67	9.62	23.67	0.17			1903.41667	-2.85380458	-3.806960898	1905.125	-0.3	-4.64	8.9554
-4.725					1990.7	3.55E-06	1951.59	9.6	23.87	0.17			1903.25	-2.576018748	-3.761108876	1904.958	-0.31	-4.39	9.13005
-4.716					1990.69	3.51E-06	1951.5	9.6	23.87	0.18			1903.08333	-2.299726919	-3.747437505	1904.791	-0.43	-4.25	9.20011
-4.651					1990.681	4.34E-06	1951.42	9.4	26.36	0.18			1902.91667	-2.174311832	-3.658110342	1904.625	-0.66	-4.23	9.28313
-4.636					1990.671	4.78E-06	1951.34	9.29	27.67	0.18			1902.75	-2.767843875	-3.802813883	1904.458	-0.38	-4.69	9.20527
-4.73					1990.662	4.53E-06	1951.25	9.26	28.06	0.18			1902.58333	-3.280209374	-3.857164508	1904.291	-0.27	-5	9.03903
-4.932					1990.653	4.58E-06	1951.17	9.28	27.86	0.18			1902.41667	-3.356604541	-3.962646826	1904.125	-0.22	-5.01	8.83943
-5.026					1990.643	4.34E-06	1951.09	9.29	27.63	0.18			1902.25	-2.908322994	-4.03677326	1903.958	-0.19	-4.76	9.03932
-4.947					1990.634	4.76E-06	1951	9.32	27.33	0.18			1902.08333	-2.711028516	-3.989790353	1903.791	-0.21	-4.42	9.12536
-4.903					1990.625	4.26E-06	1950.92	9.38	26.64	0.17			1901.91667	-2.740900504	-3.86411777	1903.625	-0.36	-4.17	9.23144
-4.811					1990.615	3.82E-06	1950.84	9.46	25.6	0.17			1901.75	-2.844800903	-3.696513159	1903.458	-0.73	-4.22	9.11456
-4.817					1990.606	3.38E-06	1950.75	9.48	25.37	0.16			1901.58333	-2.855876184	-3.842721489	1903.291	-0.49	-4.42	9.03301
-4.808					1990.597	3.45E-06	1950.67	9.48	25.37	0.16			1901.41667	-3.060375439	-3.899414614	1903.125	-0.22	-4.53	8.77339
-4.746					1990.587	3.62E-06	1950.59	9.46	25.59	0.15			1901.25	-2.872394683	-4.097038225	1902.958	-0.1	-4.4	9.11246
-4.757					1990.578	3.6E-06	1950.5	9.45	25.71	0.14			1901.08333	-2.348558418	-4.118064293	1902.791	-0.14	-4.1	9.01275
-4.745					1990.569	4.66E-06	1950.42	9.37	26.67	0.14			1900.91667	-2.122525597	-4.058700083	1902.625	-0.4	-3.97	9.18759
-4.563					1990.559	3.99E-06	1950.34	9.31	27.43	0.13			1900.75	-1.897934503	-3.614518638	1902.458	-0.91	-4.16	9.13625
-4.726					1990.55	3.93E-06	1950.25	9.26	28.05	0.12			1900.58333	-3.057233207	-3.812098128	1902.291	-0.5	-4.32	8.98346
-4.894					1990.539	3.95E-06	1950.17	9.24	28.24	0.1			1900.41667	-3.076394477	-4.12330442	1902.125	-0.51	-4.8	8.82873
-5.083					1990.527	3.86E-06	1950.09	9.26	28.01	0.09			1900.25	-2.525143106	-4.100470575	1901.958	-0.24	-4.49	8.95451
-5.094					1990.516	4.14E-06	1950	9.34	27.12	0.08			1900.08333	-2.301021033	-4.133961992	1901.791	-0.33	-4.34	9.03613
-4.993					1990.505	4.16E-06	1949.92	9.41	26.28	0.07			1899.91667	-2.501933488	-3.781930139	1901.625	-1.01	-4.04	9.2197
-4.849					1990.493	4.49E-06	1949.84	9.42	26.06	0.05			1899.75	-3.039400696	-3.747077019	1901.458	-1.8	-4.22	9.20707
-4.773					1990.482	4.08E-06	1949.75	9.53	24.82	0.04			1899.58333	-3.063186036	-3.943167599	1901.291	-1.02	-4.65	9.02635
-4.759					1990.471	4.18E-06	1949.67	9.61	23.79	0.02			1899.41667	-2.708195959	-4.245369606	1901.125	-0.31	-4.87	8.72401
-4.851					1990.46	4.28E-06	1949.59	9.57	24.24	0.01			1899.25	-2.765781326	-4.056210347	1900.958	-0.68	-4.52	8.89613
-4.827					1990.448	4.33E-06	1949.5	9.53	24.79	0			1899.08333	-2.694864476	-3.909260843	1900.791	-1.01	-4.13	9.02227
-4.598					1990.437	4.4E-06	1949.42	9.56	24.46	-0.02			1898.91667	-2.417209703	-3.78556252	1900.625	-1.61	-4.08	9.20045
-4.489					1990.426	4.67E-06	1949.34	9.52	24.85	-0.03			1898.75	-2.789387383	-3.686989379	1900.458	-1.09	-4.6	9.08243
-4.539					1990.414	5.15E-06	1949.25	9.42	26.13	-0.05			1898.58333	-3.254900315	-3.81539364	1900.291	-0.75	-4.71	9.00064
-4.673					1990.403	5.86E-06	1949.17	9.37	26.74	-0.06			1898.41667	-3.027556495	-3.967880151	1900.125	-0.67	-4.5	8.9419
-4.835					1990.392	6.75E-06	1949.09	9.42	26.15	-0.07			1898.25	-2.418046372	-4.094088294	1899.958	-0.76	-4.22	8.98046
-5.054					1990.38	7.39E-06	1949	9.38	26.56	-0.08			1898.08333	-2.537602459	-3.955078613	1899.791	-1	-4.08	9.11053
-5.186					1990.369	6.89E-06	1948.92	9.41	26.17	-0.09			1897.91667	-2.529524159	-3.72911653	1899.625	-1.54	-3.85	9.25888
-5.096					1990.358	0.000006	1948.84	9.48	25.39	-0.11			1897.75	-2.260991951	-3.504471175	1899.458	-1.27	-4.04	8.9671
-4.837					1990.346	5.52E-06	1948.75	9.55	24.53	-0.12			1897.58333	-2.218154323	-3.7292649	1899.291	-0.57	-4.64	8.95887
-4.818					1990.335	5.31E-06	1948.67	9.59	24.03	-0.13			1897.41667	-2.501709717	-3.746275372	1899.125	-0.38	-4.55	8.88671
-4.793					1990.324	5.7E-06	1948.59	9.57	24.27	-0.13			1897.25	-3.034359621	-3.884759624	1898.958	-0.76	-4.29	9.00046
-4.802					1990.313	6.02E-06	1948.5	9.56	24.4	-0.14			1897.08333	-2.393689218	-3.871901326	1898.791	-1.36	-4	9.06986
-4.712					1990.301	6.25E-06	1948.42	9.52	24.92	-0.15			1896.91667	-2.468530806	-3.887594704	1898.625	-1.3	-3.92	9.2125
-4.59					1990.29	6.56E-06	1948.34	9.48	25.31	-0.16			1896.75	-2.566650698	-3.643071523	1898.458	-1.05	-4.51	9.12382
-4.679					1990.279	6.51E-06	1948.25	9.39	26.43	-0.16			1896.58333	-2.926640536	-3.663896215	1898.291	-0.73	-4.88	8.91798

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1898.083	-3.02						1933.48	-0.07	-5.72	1937.5	-4.41715					1946.38
						1897.917	-3.26						1933.39	-0.24	-6.14	1937.67	-4.43894					1946.29
						1897.75	-3.78						1933.3	0.18	-5.38	1937.83	-4.41376					1946.21
						1897.583	-3.92						1933.2	-0.58	-5.63	1938	-4.31828					1946.13
						1897.417	-3.58						1933.11	-0.55	-5.88	1938.17	-4.276					1946.04
						1897.25	-3.14						1933.02	-0.69	-6.21	1938.33	-4.30527					1945.96
						1897.083	-3.05						1932.93	-0.8	-6.29	1938.5	-4.36228					1945.88
						1896.917	-3.49						1932.75	-0.75	-6.36	1938.67	-4.39706					1945.79
						1896.75	-3.9						1932.67	-0.77	-6.24	1938.83	-4.37783					1945.71
						1896.583	-4.09						1932.6	-0.45	-6.14	1939	-4.41067					1945.63
						1896.417	-3.63						1932.52	-0.17	-5.99	1939.17	-4.43648					1945.54
						1896.25	-3.16						1932.44	0.1	-5.68	1939.33	-4.43891					1945.46
						1896.083	-3.07						1932.37	0.17	-5.52	1939.5	-4.44334					1945.38
						1895.917	-3.36						1932.29	0.27	-5.56	1939.67	-4.45988					1945.29
						1895.75	-3.57						1932.21	0.19	-5.41	1939.83	-4.46385					1945.21
						1895.583	-3.82						1932.13	-0.1	-5.54	1940	-4.50721					1945.13
						1895.417	-3.53						1932.06	-0.3	-5.52	1940.17	-4.74447					1945.04
						1895.25	-3.07						1931.98	-0.47	-5.73	1940.33	-4.84461					1944.96
						1895.083	-2.98						1931.9	-0.77	-5.95	1940.5	-4.82089					1944.88
						1894.917	-3.3						1931.75	-0.93	-6.24	1940.67	-4.77974					1944.79
						1894.75	-3.71						1931.67	-1.04	-6.23	1940.83	-4.76415					1944.71
						1894.583	-3.7						1931.6	-1.16	-6.18	1941	-4.75112					1944.63
						1894.417	-3.44						1931.52	-0.8	-6.05	1941.17	-4.68127					1944.54
						1894.25	-2.99						1931.44	-0.75	-6.09	1941.33	-4.5567					1944.46
						1894.083	-2.91						1931.37	-1.11	-6.14	1941.5	-4.57446					1944.38
						1893.917	-3.23						1931.29	0.21	-5.68	1941.67	-4.62791					1944.29
						1893.75	-3.45						1931.21	-0.18	-5.52	1941.83	-4.58869					1944.21
						1893.583	-3.62						1931.13	-0.27	-5.6	1942	-4.48963					1944.13
						1893.417	-3.71						1931.06	-0.15	-5.7	1942.17	-4.39934					1944.04
						1893.25	-3.49						1930.98	-0.36	-5.8	1942.33	-4.33257					1943.96
						1893.083	-3.02						1930.9	-0.88	-6.31	1942.5	-4.28127					1943.88
						1892.917	-3.3						1930.75	-0.93	-6.81	1942.67	-4.24113					1943.79
						1892.75	-3.8						1930.68	-1	-6.58	1942.83	-4.22913					1943.71
						1892.583	-3.78						1930.61	-1.22	-6.49	1943	-4.22621					1943.63
						1892.417	-3.36						1930.54	-0.83	-6.52	1943.17	-4.21568					1943.54
						1892.25	-2.89						1930.46	-0.35	-6.42	1943.33	-4.19691					1943.46
						1892.083	-3.02						1930.39	0.13	-6.25	1943.5	-4.17605					1943.38
						1891.917	-3.64						1930.32	0.23	-5.9	1943.67	-4.15499					1943.29
						1891.75	-3.77						1930.25	-0.01	-5.94	1943.83	-4.19913					1943.21
						1891.583	-3.94						1930.18	0.17	-5.58	1944	-4.2814					1943.13
						1891.417	-3.73						1930.11	0.11	-5.42	1944.17	-4.35467					1943.04
						1891.25	-3.59						1930.04	0.02	-5.6	1944.33	-4.32155					1942.96
						1891.083	-3.06						1929.96	-0.22	-6.04	1944.5	-4.25419					1942.88
						1890.917	-3.28						1929.89	-0.4	-6.3	1944.67	-4.2294					1942.79
						1890.75	-3.75						1929.75	-0.55	-6.47	1944.83	-4.28602					1942.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.719					1990.267	6.58E-06	1948.17	9.4	26.34	-0.17			1896.41667	-3.381595669	-3.93356839	1898.125	-0.35	-5.03	8.84678
-4.903					1990.256	6.51E-06	1948.09	9.41	26.18	-0.17			1896.25	-3.102958168	-3.935622022	1897.958	-0.34	-4.72	8.94151
-4.853					1990.245	6.75E-06	1948	9.43	26.02	-0.18			1896.08333	-2.578745838	-4.194575154	1897.791	-0.43	-4.44	9.01619
-4.884					1990.233	6.71E-06	1947.92	9.44	25.85	-0.18			1895.91667	-2.460085243	-4.043630339	1897.625	-0.62	-4.21	9.1165
-4.663					1990.222	6.68E-06	1947.84	9.5	25.17	-0.19			1895.75	-2.581257347	-3.759376509	1897.458	-1	-4.22	9.05367
-4.672					1990.211	6.17E-06	1947.75	9.56	24.36	-0.19			1895.58333	-2.869240559	-3.735127772	1897.291	-0.61	-4.55	8.97538
-4.696					1990.199	6.39E-06	1947.67	9.65	23.3	-0.19			1895.41667	-3.259386007	-3.948774741	1897.125	-0.31	-4.76	8.89736
-4.663					1990.188	7.09E-06	1947.59	9.58	24.15	-0.2			1895.25	-2.851246447	-4.026340934	1896.958	-0.37	-4.65	8.93763
-4.56					1990.177	7.11E-06	1947.5	9.51	24.96	-0.2			1895.08333	-2.002523651	-3.707431302	1896.791	-0.76	-4.32	9.05993
-4.546					1990.166	7.04E-06	1947.42	9.39	26.48	-0.2			1894.91667	-2.881471368	-3.762905679	1896.625	-1.39	-4.14	9.10384
-4.474					1990.154	6.76E-06	1947.34	9.3	27.56	-0.2			1894.75	-2.971312951	-3.509746534	1896.458	-0.89	-4.65	8.90968
-4.51					1990.143	0.000006	1947.25	9.32	27.3	-0.21			1894.58333	-3.516687693	-4.002810515	1896.291	-0.61	-4.84	8.88098
-4.536					1990.132	5.4E-06	1947.17	9.3	27.55	-0.21			1894.41667	-3.152851878	-4.152852656	1896.125	-0.53	-4.71	8.8575
-4.748					1990.12	5.06E-06	1947.09	9.36	26.84	-0.21			1894.25	-2.83392615	-4.170039672	1895.958	-0.54	-4.32	9.16816
-4.864					1990.109	4.56E-06	1947	9.43	26.02	-0.21			1894.08333	-2.570804865	-4.039072644	1895.791	-0.7	-4.06	9.06975
-4.869					1990.098	4.62E-06	1946.92	9.5	25.09	-0.22			1893.91667	-2.608237831	-3.950438877	1895.625	-1.01	-3.95	9.30154
-4.773					1990.086	4.65E-06	1946.84	9.54	24.59	-0.22			1893.75	-2.451903031	-3.529271459	1895.458	-0.45	-4.3	9.10114
-4.718					1990.075	4.71E-06	1946.75	9.58	24.17	-0.22			1893.58333	-2.759720409	-3.833587895	1895.291	-0.71	-3.97	8.90608
-4.751					1990.064	4.9E-06	1946.67	9.61	23.79	-0.23			1893.41667	-3.243450189	-3.795171719	1895.125	-0.35	-4.88	8.88239
-4.713					1990.053	4.96E-06	1946.59	9.57	24.3	-0.23			1893.25	-2.816153403	-3.974057732	1894.958	-0.76	-4.73	8.99882
-4.614					1990.041	4.94E-06	1946.5	9.51	24.94	-0.24			1893.08333	-2.44892504	-4.183156385	1894.791	-0.78	-4.35	9.10387
-4.534					1990.03	5.09E-06	1946.42	9.35	26.95	-0.24			1892.91667	-2.237418036	-3.886425517	1894.625	-0.56	-4.14	9.16214
-4.443					1990.019	5.37E-06	1946.34	9.3	27.61	-0.25			1892.75	-2.87498422	-3.496710776	1894.458	-0.57	-4.77	9.07065
-4.518					1990.007	5.18E-06	1946.25	9.3	27.53	-0.25			1892.58333	-3.165885262	-3.580201276	1894.291	-0.59	-5.13	8.83943
-4.69					1989.996	5.12E-06	1946.17	9.29	27.69	-0.26			1892.41667	-2.84748034	-3.73566913	1894.125	-0.5	-5.05	8.77989
-4.865					1989.985	5.29E-06	1946.09	9.33	27.19	-0.27			1892.25	-2.628052933	-3.831402329	1893.958	-0.42	-4.77	9.09823
-4.804					1989.973	5.37E-06	1946	9.41	26.26	-0.28			1892.08333	-2.505932568	-3.874766557	1893.791	-0.49	-4.58	9.12949
-4.777					1989.962	5.33E-06	1945.92	9.47	25.46	-0.29			1891.91667	-2.119191824	-3.922319493	1893.625	-0.64	-4.33	9.13836
-4.746					1989.951	5.46E-06	1945.84	9.49	25.26	-0.3			1891.75	-2.568036366	-3.57760463	1893.458	-0.41	-4.42	9.04993
-4.738					1989.939	5.46E-06	1945.75	9.55	24.57	-0.31			1891.58333	-2.984971087	-3.747192688	1893.291	-0.15	-4.72	8.96717
-4.701					1989.928	5.59E-06	1945.67	9.62	23.67	-0.32			1891.41667	-3.115737639	-4.113966526	1893.125	-0.12	-4.91	8.81607
-4.646					1989.917	5.48E-06	1945.59	9.55	24.56	-0.33			1891.25	-2.529426005	-3.973860217	1892.958	-0.19	-4.77	9.01479
-4.597					1989.906	5.49E-06	1945.5	9.51	25	-0.34			1891.08333	-2.353917276	-3.85555111	1892.791	-0.21	-4.35	9.13753
-4.507					1989.894	5.47E-06	1945.42	9.44	25.91	-0.35			1890.91667	-2.318693894	-3.68791349	1892.625	-0.4	-4.05	9.17557
-4.386					1989.883	5.51E-06	1945.34	9.3	27.6	-0.37			1890.75	-3.097498836	-3.6729736	1892.458	-0.55	-4.38	9.05703
-4.428					1989.872	5.24E-06	1945.25	9.24	28.28	-0.38			1890.58333	-3.612557102	-4.074183234	1892.291	-0.52	-4.64	8.92556
-4.712					1989.86	5.05E-06	1945.17	9.28	27.85	-0.4			1890.41667	-3.012237623	-4.252941713	1892.125	-0.29	-4.77	8.86298
-4.858					1989.849	5.09E-06	1945.09	9.35	26.91	-0.41			1890.25	-2.519577863	-4.018438594	1891.958	-0.22	-4.69	8.99829
-4.795					1989.838	4.73E-06	1945	9.46	25.57	-0.42			1890.08333	-2.479470136	-3.920907619	1891.791	-0.46	-4.42	9.10883
-4.737					1989.826	4.72E-06	1944.92	9.62	23.68	-0.44			1889.91667	-2.256635826	-3.746408575	1891.625	-0.38	-4.1	9.20704
-4.76					1989.815	4.66E-06	1944.84	9.71	22.61	-0.45			1889.75	-2.913503569	-3.538474264	1891.458	-0.53	-4.22	
-4.768					1989.804	4.76E-06	1944.75	9.63	23.49	-0.47			1889.58333	-3.279796443	-3.612289499	1891.291	-0.32	-4.69	
-4.716					1989.792	4.49E-06	1944.67	9.69	22.82	-0.48			1889.41667	-2.983436703	-3.888180651	1891.125	-0.41	-5.09	
-4.667					1989.781	3.94E-06	1944.59	9.59	24.07	-0.5			1889.25	-2.79315985	-4.075774688	1890.958	-0.48	-4.84	
-4.615					1989.77	3.87E-06	1944.5	9.53	24.77	-0.51			1889.08333	-1.99369361	-4.04038871	1890.791	-0.56	-4.54	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1890.583	-3.94						1929.67	-0.77	-6.23	1945	-4.29892					1942.63
						1890.417	-3.7						1929.6	-0.76	-6.29	1945.17	-4.39298					1942.54
						1890.25	-3.27						1929.52	-0.9	-6.58	1945.33	-4.43119					1942.46
						1890.083	-3.05						1929.44	-1.03	-6.3	1945.5	-4.41689					1942.38
						1889.917	-3.46						1929.37	-0.4	-6.16	1945.67	-4.40447					1942.29
						1889.75	-3.58						1929.29	-0.18	-5.92	1945.83	-4.28036					1942.21
						1889.583	-3.75						1929.21	-0.16	-5.58	1946	-4.32306					1942.13
						1889.417	-3.77						1929.13	0.03	-5.6	1946.17	-4.41629					1942.04
						1889.25	-3.6						1929.06	-0.44	-5.78	1946.33	-4.43053					1941.96
						1889.083	-3.19						1928.98	-0.37	-6.2	1946.5	-4.43632					1941.88
						1888.917	-3.39						1928.9	-0.66	-6.47	1946.67	-4.46972					1941.79
						1888.75	-3.8						1928.75	-0.77	-6.41	1946.83	-4.51313					1941.71
						1888.583	-3.85						1928.68	-0.73	-6.44	1947	-4.60436					1941.63
						1888.417	-3.75						1928.61	-0.88	-6.49	1947.17	-4.56118					1941.54
						1888.25	-3.43						1928.54	-0.56	-6.29	1947.33	-4.51154					1941.46
						1888.083	-3.14						1928.46	-0.36	-6.33	1947.5	-4.46601					1941.38
						1887.917	-3.23						1928.39	-0.46	-6.16	1947.67	-4.36842					1941.29
						1887.75	-3.79						1928.32	-0.33	-5.78	1947.83	-4.4574					1941.21
						1887.583	-3.79						1928.25	-0.12	-5.42	1948	-4.52191					1941.13
						1887.417	-3.48						1928.18	-0.15	-5.49	1948.17	-4.71797					1941.04
						1887.25	-3.18						1928.11	-0.39	-5.78	1948.33	-4.78599					1940.96
						1887.083	-3.05						1928.04	-0.55	-5.68	1948.5	-4.72948					1940.88
						1886.917	-3.46						1927.96	-0.75	-5.93	1948.67	-4.50501					1940.79
						1886.75	-3.85						1927.89	-0.67	-6.32	1948.83	-4.51022					1940.71
						1886.583	-3.65						1927.75	-0.74	-6.58	1949	-4.60829					1940.63
						1886.417	-3.31						1927.68	-0.65	-6.1	1949.17	-4.52997					1940.54
						1886.25	-3.15						1927.61	0.01	-5.93	1949.33	-4.51779					1940.46
						1886.083	-3.16						1927.54	0.26	-5.85	1949.5	-4.51324					1940.38
						1885.917	-3.52						1927.46	0.28	-5.81	1949.67	-4.50199					1940.29
						1885.75	-3.67						1927.39	0.04	-5.81	1949.83	-4.4557					1940.21
						1885.583	-3.8						1927.32	0.13	-5.66	1950	-4.3685					1940.13
						1885.417	-3.61						1927.25	0.22	-5.46	1950.17	-4.30782					1940.04
						1885.25	-3.21						1927.18	0.03	-5.73	1950.33	-4.33212					1939.96
						1885.083	-2.98						1927.11	-0.18	-5.87	1950.5	-4.34841					1939.88
						1884.917	-3.25						1927.04	-0.47	-6.26	1950.67	-4.3784					1939.79
						1884.75	-3.36						1926.96	-0.66	-6.36	1950.83	-4.40113					1939.71
						1884.583	-3.57						1926.89	-0.17	-6.34	1951	-4.4598					1939.63
						1884.417	-3.18						1926.75	-0.35	-6.46	1951.17	-4.45907					1939.54
						1884.25	-3.07						1926.66	-0.36	-6.31	1951.33	-4.50579					1939.46
						1884.083	-2.94						1926.57	-0.06	-6.11	1951.5	-4.60617					1939.38
						1883.917	-3.33						1926.48	0.16	-5.88	1951.67	-4.71883					1939.29
						1883.75	-3.61						1926.39	0.12	-5.82	1951.83	-4.70306					1939.21
						1883.583	-3.35						1926.3	0.41	-5.54	1952	-4.69031					1939.13
						1883.417	-3.21						1926.2	1.23	-5.1	1952.17	-4.59254					1939.04
						1883.25	-2.84						1926.11	0.57	-5.35	1952.33	-4.45962					1938.96

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.498					1989.759	3.83E-06	1944.42	9.46	25.59	-0.52			1888.91667	-2.474159003	-3.928120478	1890.625	-0.64	-4.25	9.2782
-4.408					1989.747	3.95E-06	1944.34	9.34	27.08	-0.54			1888.75	-2.778052301	-3.394963404	1890.458	-0.19	-4.58	9.14449
-4.696					1989.736	3.93E-06	1944.25	9.32	27.36	-0.55			1888.58333	-2.885010884	-3.638699711	1890.291	0.07	-4.89	9.01077
-4.959					1989.725	3.87E-06	1944.17	9.37	26.7	-0.57			1888.41667	-2.915818101	-3.815003423	1890.125	-0.02	-4.76	8.94106
-5.102					1989.713	4.39E-06	1944.09	9.54	24.68	-0.58			1888.25	-2.363267286	-4.21594582	1889.958	-0.3	-4.46	9.01496
-5.092					1989.702	3.88E-06	1944	9.56	24.34	-0.59			1888.08333	-2.268304755	-4.189156633	1889.791	-0.49	-4.32	9.08887
-5.077					1989.691	4.02E-06	1943.92	9.58	24.14	-0.61			1887.91667	-2.294570007	-3.801195569	1889.625	-0.52	-4.08	9.16277
-4.988					1989.679	4.18E-06	1943.84	9.6	23.94	-0.62			1887.75	-2.949416968	-3.500210107	1889.458	-0.26	-4.7	9.13483
-4.901					1989.668	4.35E-06	1943.75	9.61	23.74	-0.63			1887.58333	-2.876418187	-3.629948772	1889.291	-0.34	-5.03	8.97284
-4.902					1989.657	4.65E-06	1943.67	9.63	23.55	-0.65			1887.41667	-2.766462383	-3.820974276	1889.125	-0.57	-4.84	8.90942
-4.856					1989.645	4.74E-06	1943.59	9.49	25.23	-0.66			1887.25	-2.452142713	-3.887478527	1888.958	-0.63	-4.41	9.07359
-4.756					1989.634	4.54E-06	1943.5	9.45	25.68	-0.67			1887.08333	-2.148454971	-3.951231829	1888.791	-0.43	-4.14	9.17935
-4.732					1989.623	4.31E-06	1943.42	9.46	25.65	-0.68			1886.91667	-2.578212991	-3.71572864	1888.625	-0.45	-4.1	9.22669
-4.69					1989.612	4.42E-06	1943.34	9.45	25.76	-0.7			1886.75	-3.099818231	-3.524591702	1888.458	-0.47	-4.54	9.07749
-4.78					1989.6	4.32E-06	1943.25	9.39	26.42	-0.71			1886.58333	-3.167596344	-3.651175014	1888.291	-0.3	-5	9.04932
-4.792					1989.589	4.24E-06	1943.17	9.37	26.7	-0.72			1886.41667	-2.93121696	-3.81232418	1888.125	-0.32	-5.02	8.89724
-4.797					1989.578	4.53E-06	1943.09	9.4	26.31	-0.74			1886.25	-2.282404563	-3.819567661	1887.958	-0.33	-4.71	8.94524
-4.773					1989.566	4.94E-06	1943	9.39	26.48	-0.75			1886.08333	-2.667231874	-4.006608874	1887.791	-0.18	-4.39	9.06301
-4.721					1989.555	4.99E-06	1942.92	9.4	26.4	-0.77			1885.91667	-2.92097591	-3.913878529	1887.625	-0.43	-4.06	9.25058
-4.797					1989.538	4.95E-06	1942.84	9.5	25.19	-0.78			1885.75	-3.110077987	-3.614917053	1887.458	-0.54	-4.18	9.16436
-4.768					1989.522	5.24E-06	1942.75	9.59	24.07	-0.8			1885.58333	-3.058296278	-3.782506364	1887.291	-0.16	-4.71	9.09969
-4.725					1989.505	5.36E-06	1942.67	9.6	23.91	-0.81			1885.41667	-3.165205798	-3.934144133	1887.125	-0.15	-5.03	8.93756
-4.686					1989.488	5.1E-06	1942.59	9.57	24.32	-0.82			1885.25	-2.635150017	-3.976976237	1886.958	-0.39	-4.92	8.95647
-4.646					1989.472	5.37E-06	1942.5	9.48	25.33	-0.84			1885.08333	-2.172087485	-3.836847272	1886.791	-0.51	-4.51	9.14077
-4.606					1989.455	6.28E-06	1942.42	9.43	26.02	-0.85			1884.91667	-2.856374693	-3.801501787	1886.625	-0.6	-4.12	9.22204
-4.597					1989.438	6.91E-06	1942.34	9.39	26.52	-0.87			1884.75	-3.093340142	-3.597674378	1886.458	-0.37	-4.33	9.11496
-4.74					1989.422	7.34E-06	1942.25	9.35	26.89	-0.88			1884.58333	-2.823059479	-3.752034592	1886.291	-0.4	-4.81	9.01803
-4.844					1989.405	7.31E-06	1942.17	9.35	26.93	-0.9			1884.41667	-3.166059543	-3.95774415	1886.125	0.44	-5.01	8.92474
-4.917					1989.388	6.73E-06	1942.09	9.41	26.18	-0.91			1884.25	-2.529587236	-3.98649948	1885.958	-0.53	-4.68	8.99946
-4.973					1989.372	5.91E-06	1942	9.53	24.8	-0.92			1884.08333	-2.159153015	-4.061903558	1885.791	-0.21	-4.12	9.15092
-4.95					1989.355	5.56E-06	1941.92	9.6	23.96	-0.94			1883.91667	-1.994461767	-3.81280653	1885.625	-0.63	-4.04	9.37912
-4.851					1989.338	5.27E-06	1941.84	9.64	23.45	-0.95			1883.75	-2.422376548	-3.498861143	1885.458	-0.67	-4.89	9.13086
-4.788					1989.322	5.16E-06	1941.75	9.66	23.18	-0.96			1883.58333	-3.043174864	-3.628110388	1885.291	-0.35	-5.19	8.94225
-4.725					1989.305	5.38E-06	1941.67	9.7	22.69	-0.97			1883.41667	-3.054144097	-3.791335756	1885.125	-0.32	-4.82	8.81328
-4.697					1989.288	4.96E-06	1941.59	9.69	22.78	-0.98			1883.25	-2.618772082	-3.8521786	1884.958	-0.48	-4.74	8.90665
-4.631					1989.272	4.89E-06	1941.5	9.56	24.44	-0.99			1883.08333	-2.385670147	-4.101839099	1884.791	-0.53	-4.38	9.11241
-4.544					1989.255	4.88E-06	1941.42	9.49	25.2	-0.99			1882.91667	-2.079108428	-3.997584388	1884.625	-0.76	-4	9.19776
-4.492					1989.238	5.18E-06	1941.34	9.51	25.01	-1			1882.75	-2.139166899	-3.671036875	1884.458	-0.48	-4.36	9.03477
-4.522					1989.222	5.43E-06	1941.25	9.45	25.73	-1			1882.58333	-3.066093259	-3.611761461	1884.291	-0.35	-4.75	8.98583
-4.79					1989.205	5.46E-06	1941.17	9.5	25.14	-1			1882.41667	-2.775700028	-3.911484594	1884.125	-0.19	-4.83	8.9369
-4.985					1989.188	5.59E-06	1941.09	9.6	23.86	-1			1882.25	-2.563978368	-4.149980708	1883.958	-0.11	-4.66	9.07033
-4.905					1989.172	5.54E-06	1941	9.66	23.19	-1			1882.08333	-2.313314904	-4.101206554	1883.791	-0.23	-4.39	9.17029
-4.822					1989.155	5.45E-06	1940.92	9.62	23.71	-1			1881.91667	-2.426286631	-3.908543799	1883.625	-0.42	-4	9.23679
-4.691					1989.138	5.12E-06	1940.84	9.64	23.41	-1			1881.75	-3.298951992	-3.757040491	1883.458	-0.25	-4.02	9.08212
-4.756					1989.122	5.16E-06	1940.75	9.65	23.26	-1			1881.58333	-2.964667862	-3.980341474	1883.291	-0.37	-4.48	8.95717

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1883.083	-2.74						1926.02	-0.06	-5.96	1952.5	-4.38					1938.88
						1882.917	-3.06						1925.93	-0.83	-6.39	1952.67	-4.40689					1938.79
						1882.75	-3.32						1925.75	-1.11	-6.41	1952.83	-4.44145					1938.71
						1882.583	-3.58						1925.67	-0.81	-6.15	1953	-4.6338					1938.63
						1882.417	-3.91						1925.6	-0.47	-5.93	1953.17	-4.61898					1938.54
						1882.25	-3.44						1925.52	-0.46	-6.08	1953.33	-4.51183					1938.46
						1882.083	-2.95						1925.44	-0.22	-5.89	1953.5	-4.55015					1938.38
						1881.917	-3.04						1925.37	-0.15	-5.68	1953.67	-4.6624					1938.29
						1881.75	-3.45						1925.29	0.22	-5.46	1953.83	-4.65338					1938.21
						1881.583	-3.72						1925.21	0.37	-5.23	1954	-4.5838					1938.13
						1881.417	-3.93						1925.13	0.35	-5.36	1954.17	-4.50843					1938.04
						1881.25	-3.44						1925.06	0.26	-5.56	1954.33	-4.46736					1937.96
						1881.083	-3.22						1924.98	0.33	-5.38	1954.5	-4.45488					1937.88
						1880.917	-3.46						1924.9	0.01	-5.55	1954.67	-4.43423					1937.79
						1880.75	-3.63						1924.75	-0.13	-5.84	1954.83	-4.38118					1937.71
						1880.583	-3.78						1924.68	-0.22	-5.87	1955	-4.31888					1937.63
						1880.417	-3.38						1924.62	0.14	-5.75	1955.17	-4.31303					1937.54
						1880.25	-3.05						1924.55	0.16	-5.87	1955.33	-4.36878					1937.46
						1880.083	-3.02						1924.48	0.35	-5.95	1955.5	-4.40844					1937.38
						1879.917	-3.46						1924.42	-0.09	-5.96	1955.67	-4.33107					1937.29
						1879.75	-3.72						1924.35	0.02	-5.82	1955.83	-4.28923					1937.21
						1879.583	-3.83						1924.28	0	-5.32	1956	-4.19137					1937.13
						1879.417	-3.68						1924.22	0.81	-5.23	1956.17	-4.23055					1937.04
						1879.25	-3.42						1924.15	0.72	-5.25	1956.33	-4.2847					1936.96
						1879.083	-3.06						1924.08	0.69	-5.31	1956.5	-4.2942					1936.88
						1878.917	-3.23						1924.02	0.24	-5.54	1956.67	-4.32804					1936.79
						1878.75	-3.63						1923.95	-0.11	-5.91	1956.83	-4.33817					1936.71
						1878.583	-3.91						1923.88	-0.16	-6.16	1957	-4.34729					1936.63
						1878.417	-3.67						1923.75	-0.26	-6.2	1957.17	-4.37074					1936.54
						1878.25	-3.31						1923.67	-0.64	-5.9	1957.33	-4.43132					1936.46
						1878.083	-2.93						1923.6	-0.41	-5.7	1957.5	-4.50668					1936.38
						1877.917	-3.21						1923.52	-0.79	-6	1957.67	-4.55686					1936.29
						1877.75	-3.57						1923.44	-0.17	-5.79	1957.83	-4.62202					1936.21
						1877.583	-3.92						1923.37	0.09	-5.62	1958	-4.68658					1936.13
						1877.417	-3.78						1923.29	0.35	-5.47	1958.17	-4.70107					1936.04
						1877.25	-3.39						1923.21	0.66	-5.21	1958.33	-4.6139					1935.96
						1877.083	-3.05						1923.13	0.47	-5.39	1958.5	-4.55752					1935.88
						1876.917	-3.22						1923.06	0.51	-5.34	1958.67	-4.48949					1935.79
						1876.75	-3.55						1922.98	0.21	-5.52	1958.83	-4.53299					1935.71
						1876.583	-3.68						1922.9	-0.16	-6.15	1959	-4.63069					1935.63
						1876.417	-3.5						1922.75	0.3	-7.13	1959.17	-4.61166					1935.54
						1876.25	-3.07						1922.68	-0.43	-6.57	1959.33	-4.46681					1935.46
						1876.083	-2.84						1922.61	-0.67	-6.62	1959.5	-4.33714					1935.38
						1875.917	-3.18						1922.54	-0.14	-6.24	1959.67	-4.33593					1935.29
						1875.75	-3.28						1922.46	0.5	-5.82	1959.83	-4.36098					1935.21

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.727					1989.105	5.01E-06	1940.67	9.7	22.7	-0.99			1881.41667	-2.817048878	-4.311109623	1883.125	-0.14	-4.89	8.88136
-4.729					1989.088	4.94E-06	1940.59	9.61	23.79	-0.98			1881.25	-2.583078876	-4.090530903	1882.958	-0.39	-4.76	8.89447
-4.627					1989.072	5.12E-06	1940.5	9.59	24.04	-0.98			1881.08333	-2.088945699	-4.028666082	1882.791	-0.02	-4.48	9.10519
-4.563					1989.055	4.93E-06	1940.42	9.49	25.19	-0.97			1880.91667	-2.406534557	-3.878730404	1882.625	-0.17	-4.11	9.19992
-4.528					1989.038	4.99E-06	1940.34	9.44	25.89	-0.96			1880.75	-3.052299554	-3.753665296	1882.458	-0.3	-4.3	9.12936
-4.609					1989.022	4.82E-06	1940.25	9.41	26.27	-0.95			1880.58333	-3.651822936	-4.117941563	1882.291	-0.19	-4.8	9.0205
-4.725					1989.005	4.76E-06	1940.17	9.42	26.12	-0.94			1880.41667	-3.313170385	-4.167736001	1882.125	-0.27	-4.93	8.87334
-4.956					1988.988	4.83E-06	1940.09	9.43	25.94	-0.93			1880.25	-2.760604646	-4.287216046	1881.958	-0.59	-4.54	8.92998
-5.079					1988.972	4.61E-06	1940	9.43	25.95	-0.92			1880.08333	-2.366877972	-4.194957661	1881.791	-0.6	-4.13	9.13687
-4.969					1988.955	4.69E-06	1939.92	9.46	25.56	-0.91			1879.91667	-2.29734737	-4.162994346	1881.625	-0.7	-4.11	9.20785
-4.943					1988.938	0.000004	1939.84	9.49	25.19	-0.9			1879.75	-2.479881401	-3.860310966	1881.458	-0.59	-4.43	9.01484
-4.832					1988.358	0.000004	1939.75	9.58	24.12	-0.89			1879.58333	-3.041437133	-3.828737876	1881.291	-0.67	-4.97	8.89271
-4.773					1988.342	4.7E-06	1939.67	9.62	23.67	-0.88			1879.41667	-3.249419134	-4.322190406	1881.125	-0.45	-4.88	8.84147
-4.841					1988.326	4.92E-06	1939.59	9.58	24.11	-0.87			1879.25	-2.760062591	-4.539281211	1880.958	-0.69	-4.45	8.91868
-4.768					1988.31	4.86E-06	1939.5	9.58	24.15	-0.86			1879.08333	-2.69056989	-4.143114698	1880.791	-0.64	-4.21	9.07439
-4.624					1988.294	5.17E-06	1939.42	9.47	25.54	-0.85			1878.91667	-2.378491123	-3.77589856	1880.625	-0.94	-4.17	9.18855
-4.514					1988.278	5.31E-06	1939.34	9.4	26.32	-0.84			1878.75	-2.972795718	-3.629603508	1880.458	-0.36	-4.66	9.11306
-4.762					1988.263	5.52E-06	1939.25	9.32	27.34	-0.83			1878.58333	-3.38222564	-3.886041834	1880.291	-0.05	-5.09	8.93638
-5.035					1988.247	5.39E-06	1939.17	9.33	27.25	-0.82			1878.41667	-2.923601216	-3.821681667	1880.125	-0.02	-4.96	8.90842
-5.076					1988.231	6.35E-06	1939.09	9.38	26.59	-0.81			1878.25	-2.517027273	-4.087206941	1879.958	-0.49	-4.69	9.00169
-5.09					1988.215	6.89E-06	1939	9.44	25.85	-0.8			1878.08333	-2.427972735	-4.068970665	1879.791	-0.53	-4.18	9.13384
-4.996					1988.199	8.14E-06	1938.92	9.47	25.48	-0.8			1877.91667	-1.807193873	-3.982799031	1879.625	-0.6	-4.16	9.21289
-4.848					1988.183	6.75E-06	1938.84	9.51	25.01	-0.79			1877.75	-2.641319754	-3.710668799	1879.458	-0.34	-4.43	9.19322
-4.777					1988.168	6.15E-06	1938.75	9.56	24.4	-0.79			1877.58333	-3.222291168	-3.807808214	1879.291	-0.53	-4.79	9.03247
-4.778					1988.152	5.43E-06	1938.67	9.62	23.67	-0.78			1877.41667	-3.336115665	-4.024385198	1879.125	-0.59	-4.82	8.906
-4.764					1988.136	5.39E-06	1938.59	9.56	24.42	-0.78			1877.25	-2.898923686	-4.054243547	1878.958	-0.52	-4.59	9.03054
-4.73					1988.12	4.66E-06	1938.5	9.53	24.72	-0.77			1877.08333	-2.351509609	-3.992238279	1878.791	-0.52	-4.38	9.14098
-4.76					1988.104	4.62E-06	1938.42	9.51	24.96	-0.77			1876.91667	-1.916199395	-3.947394618	1878.625	-0.71	-4.22	9.15434
-4.576					1988.088	4.77E-06	1938.34	9.41	26.22	-0.76			1876.75	-2.126767779	-3.839993494	1878.458	-0.48	-4.32	9.08223
-4.626					1988.073	4.79E-06	1938.25	9.42	26.14	-0.76			1876.58333	-2.915754162	-3.864648224	1878.291	-0.31	-4.75	8.94855
-4.861					1988.057	4.73E-06	1938.17	9.39	26.5	-0.76			1876.41667	-3.051772353	-4.053995166	1878.125	-0.14	-4.95	8.9378
-5.114					1988.041	4.6E-06	1938.09	9.51	25	-0.76			1876.25	-2.407983145	-3.963841238	1877.958	-0.09	-4.77	9.07279
-5.113					1988.025	4.32E-06	1938	9.5	25.15	-0.75			1876.08333	-2.324440428	-4.240843591	1877.791	-0.2	-4.35	9.17962
-5.016					1988.009	4.32E-06	1937.92	9.58	24.1	-0.75			1875.91667	-2.297217596	-4.1405742	1877.625	-0.21	-4	9.25828
-4.885					1987.993	4.26E-06	1937.84	9.6	23.94	-0.75			1875.75	-2.394337089	-3.842203617	1877.458	-0.57	-4.04	9.19026
-4.766					1987.978	4.15E-06	1937.75	9.56	24.35	-0.75			1875.58333	-2.897864066	-3.86775677	1877.291	0.04	-4.65	9.08467
-4.742					1987.962	4.08E-06	1937.67	9.6	23.91	-0.75			1875.41667	-3.138996616	-4.125623132	1877.125	-0.46	-4.8	8.94149
-4.732					1987.946	4.15E-06	1937.59	9.52	24.91	-0.74			1875.25	-2.810760134	-4.230014021	1876.958	-0.39	-4.3	8.96382
-4.632					1987.93	4.13E-06	1937.5	9.46	25.64	-0.74			1875.08333	-2.508772965	-4.206635873	1876.791	-0.09	-4.1	9.06446
-4.549					1987.914	4.12E-06	1937.42	9.4	26.28	-0.74			1874.91667	-2.361323757	-4.120598935	1876.625	-0.29	-4.1	9.24342
-4.516					1987.898	3.97E-06	1937.34	9.38	26.54	-0.74			1874.75	-2.427364432	-3.819046344	1876.458	-0.07	-4.57	9.06429
-4.56					1987.883	3.96E-06	1937.25	9.36	26.87	-0.74			1874.58333	-2.878086414	-3.702469526	1876.291	0.17	-4.92	8.95806
-4.576					1987.867	4.11E-06	1937.17	9.37	26.67	-0.74			1874.41667	-3.064180626	-4.047092118	1876.125	0.04	-4.84	8.93279
-4.745					1987.851	3.86E-06	1937.09	9.44	25.84	-0.74			1874.25	-2.407552502	-4.306430623	1875.958	-0.21	-4.72	8.99752
-4.824					1987.835	0.000004	1937	9.51	25.01	-0.74			1874.08333	-2.291676068	-4.238459816	1875.791	-0.13	-4.47	9.25547

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD	10 corals 5-yr gaussian	Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals		Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1875.583	-3.38						1922.39	0.45	-5.4	1960	-4.37203					1935.13
						1875.417	-3.8						1922.32	0.59	-5.13	1960.17	-4.37317					1935.04
						1875.25	-3.48						1922.25	0.33	-5.05	1960.33	-4.37629					1934.96
						1875.083	-3.05						1922.18	0.24	-5.05	1960.5	-4.37919					1934.88
						1874.917	-3.3						1922.11	0.02	-5.3	1960.67	-4.37446					1934.79
						1874.75	-3.48						1922.04	0.36	-5.67	1960.83	-4.35634					1934.71
						1874.583	-3.52						1921.96	0.08	-5.54	1961	-4.31974					1934.63
						1874.417	-3.61						1921.89	0.07	-5.44	1961.17	-4.58151					1934.54
						1874.25	-3.13						1921.75	0.06	-6.18	1961.33	-4.57774					1934.46
						1874.083	-2.75						1921.64	0.56	-5.64	1961.5	-4.53625					1934.38
						1873.917	-3.1						1921.53	0.48	-5.41	1961.67	-4.54938					1934.29
						1873.75	-3.55						1921.42	0.71	-5.26	1961.83	-4.44658					1934.21
						1873.583	-3.74						1921.31	0.45	-5.13	1962	-4.3274					1934.13
						1873.417	-3.58						1921.19	0.39	-5.32	1962.17	-4.3409					1934.04
						1873.25	-3.19						1921.08	0.24	-5.78	1962.33	-4.39321					1933.96
						1873.083	-2.96						1920.97	-0.11	-5.71	1962.5	-4.44248					1933.88
						1872.917	-3.44						1920.75	-0.43	-6.08	1962.67	-4.38103					1933.79
						1872.75	-3.77						1920.68	-0.26	-6.06	1962.83	-4.30995					1933.71
						1872.583	-3.75						1920.62	-0.02	-5.5	1963	-4.20935					1933.63
						1872.417	-3.48						1920.55	0.49	-5.44	1963.17	-4.22702					1933.54
						1872.25	-3.24						1920.48	0.4	-5.38	1963.33	-4.28852					1933.46
						1872.083	-3.14						1920.42	0.16	-5.74	1963.5	-4.31739					1933.38
						1871.917	-3.3						1920.35	0.35	-5.5	1963.67	-4.38388					1933.29
						1871.75	-3.57						1920.28	0.68	-5.55	1963.83	-4.46081					1933.21
						1871.583	-3.7						1920.22	0.6	-5.35	1964	-4.5184					1933.13
						1871.417	-3.51						1920.15	0.53	-5.68	1964.17	-4.46597					1933.04
						1871.25	-3.21						1920.08	0.21	-5.9	1964.33	-4.35402					1932.96
						1871.083	-3.01						1920.02	-0.22	-6.1	1964.5	-4.21818					1932.88
						1870.917	-3.35						1919.95	-0.57	-6.41	1964.67	-4.29895					1932.79
						1870.75	-3.6						1919.88	-0.45	-6.34	1964.83	-4.39911					1932.71
						1870.583	-3.88						1919.75	0.19	-6.36	1965	-4.51386					1932.63
						1870.417	-3.75						1919.67	-0.19	-6.13	1965.17	-4.5268					1932.54
						1870.25	-3.24						1919.58	-0.05	-6.02	1965.33	-4.54758					1932.46
						1870.083	-3.11						1919.5	-0.09	-5.93	1965.5	-4.66677					1932.38
						1869.917	-3.32						1919.42	0.4	-5.71	1965.67	-4.93675					1932.29
						1869.75	-3.74						1919.33	0.16	-5.31	1965.83	-5.07253					1932.21
						1869.583	-4.01						1919.25	0.04	-5.59	1966	-4.99247					1932.13
						1869.417	-3.58						1919.17	0.14	-5.41	1966.17	-4.77681					1932.04
						1869.25	-3.12						1919.08	0.35	-5.52	1966.33	-4.59338					1931.96
						1869.083	-2.98						1919	-0.23	-6.09	1966.5	-4.55815					1931.88
						1868.917	-3.49						1918.92	0.02	-6.24	1966.67	-4.55959					1931.79
						1868.75	-3.82						1918.75	-0.27	-6.33	1966.83	-4.54207					1931.71
						1868.583	-3.79						1918.66	0	-6.24	1967	-4.41701					1931.63
						1868.417	-3.67						1918.57	-0.16	-6.33	1967.17	-4.4155					1931.54
						1868.25	-3.28						1918.48	-0.21	-5.99	1967.33	-4.43723					1931.46

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.893					1987.819	4.08E-06	1936.92	9.58	24.12	-0.73			1873.91667	-2.111319818	-4.049594351	1875.625	-0.3	-3.9	9.2583
-4.826					1987.803	4.07E-06	1936.84	9.62	23.67	-0.73			1873.75	-2.881217394	-3.799543243	1875.458	-0.71	-4.61	9.06154
-4.779					1987.788	4.04E-06	1936.75	9.64	23.37	-0.73			1873.58333	-2.994800938	-3.868721989	1875.291	0	-5.11	8.95362
-4.743					1987.772	4.24E-06	1936.67	9.69	22.82	-0.73			1873.41667	-3.069570692	-4.315221226	1875.125	-0.28	-4.93	8.93454
-4.789					1987.756	4.06E-06	1936.59	9.65	23.3	-0.73			1873.25	-2.459420878	-4.419339087	1874.958	-0.11	-4.5	8.99141
-4.716					1987.74	4.29E-06	1936.5	9.63	23.49	-0.72			1873.08333	-2.178411158	-4.410941951	1874.791	-0.45	-4.3	9.12291
-4.651					1987.724	4.22E-06	1936.42	9.57	24.27	-0.72			1872.91667	-1.971601616	-4.239799144	1874.625	-0.67	-4.3	9.30345
-4.563					1987.708	4.14E-06	1936.34	9.51	24.96	-0.71			1872.75	-2.465889161	-3.868391171	1874.458	-0.26	-4.87	9.06095
-4.596					1987.693	3.95E-06	1936.25	9.39	26.45	-0.71			1872.58333	-2.944982139	-3.943235875	1874.291	-0.04	-5.12	8.93267
-4.648					1987.677	3.98E-06	1936.17	9.37	26.77	-0.71			1872.41667	-3.209073301	-4.138514187	1874.125	0.01	-5.07	8.91861
-4.693					1987.661	4.16E-06	1936.09	9.37	26.7	-0.7			1872.25	-2.787701949	-4.153518879	1873.958	-0.23	-4.8	9.00572
-4.706					1987.645	4.05E-06	1936	9.4	26.36	-0.7			1872.08333	-2.658778892	-4.182390739	1873.791	-0.31	-4.5	9.15323
-4.697					1987.629	4.14E-06	1935.92	9.43	25.95	-0.69			1871.91667	-2.336667479	-3.889927153	1873.625	-0.23	-4.15	9.29698
-4.653					1987.613	4.16E-06	1935.84	9.43	25.95	-0.69			1871.75	-2.562563036	-3.755413939	1873.458	-0.07	-4.47	9.13522
-4.482					1987.598	4.14E-06	1935.75	9.47	25.51	-0.68			1871.58333	-2.828662838	-3.836832611	1873.291	-0.03	-4.67	9.17883
-4.544					1987.582	4.16E-06	1935.67	9.56	24.4	-0.68			1871.41667	-3.139820371	-4.012648224	1873.125	0.04	-4.82	9.09511
-4.569					1987.566	4.17E-06	1935.59	9.52	24.84	-0.67			1871.25	-2.705366707	-4.030110582	1872.958	-0.02	-4.73	9.13419
-4.591					1987.55	4.22E-06	1935.5	9.51	24.96	-0.67			1871.08333	-2.141751726	-4.064109677	1872.791	-0.26	-4.37	9.17327
-4.542					1987.533	4.23E-06	1935.42	9.53	24.8	-0.66			1870.91667	-2.030028308	-4.05422782	1872.625	-0.31	-4.12	9.21235
-4.51					1987.516	4.17E-06	1935.34	9.46	25.58	-0.66			1870.75	-2.578434882	-3.749987562	1872.458	-0.71	-4.44	9.1793
-4.593					1987.499	4.08E-06	1935.25	9.44	25.8	-0.65			1870.58333	-3.101048323	-3.870817469	1872.291	-0.52	-4.79	9.05116
-4.8					1987.483	4.09E-06	1935.17	9.42	26.06	-0.64			1870.41667	-2.738209164	-4.243459479	1872.125	-0.21	-4.91	8.82793
-4.962					1987.466	4.09E-06	1935.09	9.47	25.54	-0.64			1870.25	-2.678946935	-4.190238011	1871.958	-0.03	-4.69	8.89264
-5.074					1987.449	4.1E-06	1935	9.53	24.72	-0.63			1870.08333	-2.398774467	-3.932497716	1871.791	-0.08	-4.28	9.0508
-4.924					1987.432	4.08E-06	1934.92	9.57	24.22	-0.62			1869.91667	-2.334185153	-3.950188358	1871.625	-0.59	-4.28	9.2482
-4.893					1987.415	4.24E-06	1934.84	9.54	24.68	-0.62			1869.75	-2.625909875	-3.713184707	1871.458	-0.48	-4.6	9.18308
-4.818					1987.398	4.03E-06	1934.75	9.64	23.47	-0.61			1869.58333	-3.15623713	-3.785765252	1871.291	-0.21	-5.08	8.98916
-4.685					1987.381	4.07E-06	1934.67	9.71	22.57	-0.6			1869.41667	-2.814897044	-3.918396694	1871.125	0.23	-5.13	8.87804
-4.573					1987.364	4.02E-06	1934.59	9.61	23.83	-0.59			1869.25	-2.349876352	-4.049248598	1870.958	-0.14	-4.82	8.90281
-4.484					1987.348	3.96E-06	1934.5	9.53	24.79	-0.58			1869.08333	-2.09229438	-4.076605375	1870.791	0.19	-4.4	8.97387
-4.383					1987.331	3.95E-06	1934.42	9.5	25.16	-0.57			1868.91667	-2.296852392	-3.872470254	1870.625	-0.25	-4.12	9.24025
-4.297					1987.314	4.07E-06	1934.34	9.41	26.18	-0.56			1868.75	-2.974854229	-3.808056849	1870.458	-0.56	-4.42	9.12338
-4.437					1987.297	4.06E-06	1934.25	9.35	26.92	-0.55			1868.58333	-2.456211928	-4.117662808	1870.291	-0.39	-4.89	9.00269
-4.61					1987.28	4.13E-06	1934.17	9.34	27.07	-0.54			1868.41667	-2.94265159	-4.130900518	1870.125	0.02	-5.17	8.92955
-4.778					1987.263	4.26E-06	1934.09	9.39	26.45	-0.53			1868.25	-2.475663914	-4.210115592	1869.958	-0.25	-4.46	9.08223
-4.777					1987.246	4.1E-06	1934	9.43	25.96	-0.52			1868.08333	-2.282124148	-4.231606577	1869.791	-0.13	-4.27	9.18342
-4.705					1987.23	4.2E-06	1933.92	9.43	25.95	-0.51			1867.91667	-2.37809514	-4.179868069	1869.625	-0.59	-4.08	9.23314
-4.692					1987.213	3.99E-06	1933.84	9.49	25.21	-0.5			1867.75	-2.598315184	-3.659460166	1869.458	-0.2	-4.47	9.20105
-4.719					1987.196	3.95E-06	1933.75	9.58	24.19	-0.49			1867.58333	-2.718413019	-3.741640942	1869.291	-0.13	-4.67	9.12113
-4.741					1987.179	4.07E-06	1933.67	9.62	23.67	-0.48			1867.41667	-3.039731181	-3.699201047	1869.125	-0.37	-4.67	8.9934
-4.718					1987.162	4.31E-06	1933.59	9.6	23.9	-0.47			1867.25	-3.19500539	-3.916950087	1868.958	-0.28	-4.54	9.0086
-4.663					1987.145	4.31E-06	1933.5	9.55	24.49	-0.46			1867.08333	-2.728832027	-3.987850809	1868.791	-0.17	-4.36	9.1798
-4.589					1987.128	4.47E-06	1933.42	9.53	24.76	-0.45			1866.91667	-2.360832454	-3.927254631	1868.625	-0.02	-4.13	9.29728
-4.502					1987.112	4.33E-06	1933.34	9.45	25.76	-0.45			1866.75	-2.423249194	-3.544332079	1868.458	-0.29	-4.28	9.09882
-4.677					1987.095	4.22E-06	1933.25	9.42	26.09	-0.44			1866.58333	-2.722976789	-3.662996504	1868.291	-0.1	-4.65	8.98041

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1868.083	-2.99						1918.39	0.3	-5.7	1967.5	-4.4248					1931.38
						1867.917	-3.18						1918.3	0.84	-5.57	1967.67	-4.41149					1931.29
						1867.75	-3.36						1918.2	0.28	-5.47	1967.83	-4.45263					1931.21
						1867.583	-3.73						1918.11	-0.15	-5.45	1968	-4.57354					1931.13
						1867.417	-3.84						1918.02	-0.25	-6.03	1968.17	-4.56987					1931.04
						1867.25	-3.46						1917.93	-0.33	-6.22	1968.33	-4.50444					1930.96
						1867.083	-3.14						1917.75	-0.59	-6.29	1968.5	-4.4425					1930.88
						1866.917	-3.53						1917.65	-0.82	-5.97	1968.67	-4.41485					1930.79
						1866.75	-3.75						1917.55	-0.23	-5.68	1968.83	-4.46804					1930.71
						1866.583	-3.82						1917.45	0.02	-5.76	1969	-4.63696					1930.63
						1866.417	-3.57						1917.35	0.36	-5.57	1969.17	-4.77229					1930.54
						1866.25	-3.42						1917.25	0.12	-5.59	1969.33	-4.65427					1930.46
						1866.083	-3.14						1917.15	-0.24	-5.67	1969.5	-4.62167					1930.38
						1865.917	-3.61						1917.05	-0.28	-6.62	1969.67	-4.60034					1930.29
						1865.75	-3.72						1916.95	-0.74	-6.31	1969.83	-4.48431					1930.21
						1865.583	-3.9						1916.75	-1.2	-6.83	1970	-4.42058					1930.13
						1865.417	-4.05						1916.67	-0.92	-6.36	1970.17	-4.44801					1930.04
						1865.25	-3.63						1916.6	-0.67	-6.11	1970.33	-4.45163					1929.96
						1865.083	-3.29						1916.52	-0.65	-6.03	1970.5	-4.42776					1929.88
						1864.917	-3.35						1916.44	-0.67	-5.87	1970.67	-4.37507					1929.79
						1864.75	-3.87						1916.37	-0.08	-6	1970.83	-4.3277					1929.71
						1864.583	-3.75						1916.29	0.12	-5.83	1971	-4.29163					1929.63
						1864.417	-3.47						1916.21	0.11	-5.59	1971.17	-4.3103					1929.54
						1864.25	-3.17						1916.13	0.25	-5.72	1971.33	-4.36722					1929.46
						1864.083	-3.03						1916.06	0.12	-5.97	1971.5	-4.51554					1929.38
						1863.917	-3.22						1915.98	0.07	-5.85	1971.67	-4.53428					1929.29
						1863.75	-3.51						1915.9	-0.15	-6.09	1971.83	-4.5027					1929.21
						1863.583	-3.65						1915.75	-0.23	-6.29	1972	-4.526					1929.13
						1863.417	-3.68						1915.67	-0.28	-6.02	1972.17	-4.61493					1929.04
						1863.25	-3.28						1915.6	0.14	-5.88	1972.33	-4.67057					1928.96
						1863.083	-2.59						1915.52	-0.07	-5.87	1972.5	-4.70891					1928.88
						1862.917	-2.64						1915.44	-0.11	-5.93	1972.67	-4.85747					1928.79
						1862.75	-3.27						1915.37	0.23	-5.63	1972.83	-5.05686					1928.71
						1862.583	-3.64						1915.29	0.43	-5.5	1973	-5.10109					1928.63
						1862.417	-3.64						1915.21	0.38	-5.4	1973.17	-4.99904					1928.54
						1862.25	-3.37						1915.13	0.33	-5.44	1973.33	-4.6487					1928.46
						1862.083	-3.05						1915.06	0.23	-5.65	1973.5	-4.42153					1928.38
						1861.917	-3.42						1914.98	0.11	-5.96	1973.67	-4.39444					1928.29
						1861.75	-3.64						1914.9	-0.1	-6.27	1973.83	-4.35914					1928.21
						1861.583	-3.72						1914.75	-0.53	-6.38	1974	-4.35275					1928.13
						1861.417	-3.47						1914.66	-0.1	-6.31	1974.17	-4.37698					1928.04
						1861.25	-3.09						1914.57	-0.04	-6.44	1974.33	-4.49134					1927.96
						1861.083	-2.89						1914.48	0.78	-5.94	1974.5	-4.58489					1927.88
						1860.917	-3.3						1914.39	0.46	-5.63	1974.67	-4.51655					1927.79
						1860.75	-3.58						1914.3	0.52	-5.51	1974.83	-4.42461					1927.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.885					1987.078	4.2E-06	1933.17	9.38	26.62	-0.43			1866.41667	-3.191637597	-3.858887468	1868.125	-0.06	-4.84	8.94206
-5.043					1987.061	4.58E-06	1933.09	9.39	26.5	-0.42			1866.25	-2.063181222	-3.827367681	1867.958	-0.25	-4.72	8.95042
-5.073					1987.044	4.45E-06	1933	9.37	26.71	-0.41			1866.08333	-2.494167985	-3.782342795	1867.791	-0.47	-4.34	9.09084
-4.971					1987.027	4.43E-06	1932.92	9.31	27.43	-0.41			1865.91667	-2.550711293	-3.745888838	1867.625	-0.51	-3.85	9.20141
-4.809					1987.01	4.43E-06	1932.84	9.39	26.42	-0.4			1865.75	-2.714724013	-3.524686047	1867.458	-0.78	-4.32	9.02119
-4.771					1986.993	5.51E-06	1932.75	9.5	25.08	-0.4			1865.58333	-2.745144828	-3.587585252	1867.291	-0.6	-5.06	8.87246
-4.724					1986.977	5.12E-06	1932.67	9.57	24.27	-0.39			1865.41667	-2.811804537	-3.760930563	1867.125	-0.22	-5.05	8.75011
-4.771					1986.96	5.17E-06	1932.59	9.54	24.6	-0.39			1865.25	-2.702613521	-3.883524535	1866.958	-0.5	-4.4	8.93275
-4.746					1986.943	4.59E-06	1932.5	9.47	25.5	-0.38			1865.08333	-2.661331026	-3.849636672	1866.791	-0.52	-4.16	9.09719
-4.633					1986.926	3.81E-06	1932.42	9.48	25.34	-0.38			1864.91667	-2.181316315	-4.201117037	1866.625	-0.61	-4.11	9.24342
-4.533					1986.909	3.84E-06	1932.34	9.41	26.19	-0.38			1864.75	-2.167828009	-3.686422485	1866.458	-0.37	-4.44	9.17386
-4.683					1986.892	3.88E-06	1932.25	9.34	27.1	-0.38			1864.58333	-2.843072592	-3.685638643	1866.291	-0.31	-4.8	9.06867
-4.944					1986.875	3.96E-06	1932.17	9.33	27.2	-0.37			1864.41667	-3.321000601	-3.909976511	1866.125	-0.31	-5	8.92783
-4.993					1986.859	3.94E-06	1932.09	9.37	26.75	-0.37			1864.25	-2.866784922	-4.024518801	1865.958	-0.25	-4.83	8.9628
-4.99					1986.842	4.09E-06	1932	9.39	26.47	-0.37			1864.08333	-2.492235894	-4.147445014	1865.791	-0.1	-4.29	9.12321
-4.844					1986.825	4.06E-06	1931.92	9.38	26.61	-0.37			1863.91667	-2.353698728	-3.946954278	1865.625	-0.05	-3.8	9.24228
-4.746					1986.808	4.01E-06	1931.84	9.53	24.79	-0.37			1863.75	-2.850072849	-3.579779506	1865.458	-0.27	-4.03	9.0885
-4.704					1986.791	4.15E-06	1931.75	9.63	23.51	-0.37			1863.58333	-3.152368524	-3.619527024	1865.291	-0.02	-4.63	8.98105
-4.709					1986.774	4.07E-06	1931.67	9.67	23.06	-0.37			1863.41667	-3.167832116	-4.155341491	1865.125	-0.14	-4.76	8.91994
-4.621					1986.757	4.22E-06	1931.59	9.64	23.38	-0.37			1863.25	-2.47955085	-4.595417851	1864.958	-0.4	-4.53	9.09454
-4.55					1986.741	4.38E-06	1931.5	9.61	23.78	-0.37			1863.08333	-2.575455515	-4.147671381	1864.791	-0.39	-4.3	9.14342
-4.484					1986.724	4.47E-06	1931.42	9.57	24.32	-0.37			1862.91667	-2.593459105	-3.943103597	1864.625	-0.62	-4.08	9.18952
-4.449					1986.707	4.56E-06	1931.34	9.48	25.41	-0.37			1862.75	-2.578516229	-3.719722161	1864.458	-0.53	-4.18	8.99085
-4.572					1986.69	4.4E-06	1931.25	9.43	25.98	-0.37			1862.58333	-2.832113173	-3.766736027	1864.291	-0.41	-4.62	8.94515
-4.802					1986.673	4.09E-06	1931.17	9.37	26.69	-0.36			1862.41667	-3.165192494	-4.206504329	1864.125	-0.33	-4.81	8.87798
-4.915					1986.656	4.16E-06	1931.09	9.39	26.49	-0.36			1862.25	-2.52916427	-4.260197156	1863.958	-0.34	-4.71	9.00069
-4.86					1986.639	4.03E-06	1931	9.44	25.88	-0.36			1862.08333	-2.305444563	-4.016085915	1863.791	-0.4	-4.46	9.1234
-4.724					1986.622	4.02E-06	1930.92	9.43	26.01	-0.36			1861.91667	-2.332057427	-3.910615105	1863.625	-0.26	-4.02	9.24612
-4.657					1986.606	4.05E-06	1930.84	9.55	24.53	-0.36			1861.75	-2.684951547	-3.6395961	1863.458	-0.78	-4.12	9.14081
-4.564					1986.589	4.09E-06	1930.75	9.62	23.67	-0.36			1861.58333	-3.026650781	-3.77370734	1863.291	-0.32	-4.7	8.98613
-4.588					1986.572	4.03E-06	1930.67	9.67	23.06	-0.36			1861.41667	-3.172422332	-3.952922413	1863.125	0.11	-4.9	8.94991
-4.574					1986.555	3.95E-06	1930.59	9.62	23.64	-0.36			1861.25	-2.721792597	-4.024349141	1862.958	-0.56	-4.65	9.0472
-4.582					1986.54	4.01E-06	1930.5	9.54	24.68	-0.35			1861.08333	-2.156187316	-4.006066083	1862.791	-0.06	-4.13	9.10309
-4.496					1986.525	4.02E-06	1930.42	9.49	25.23	-0.35			1860.91667	-2.714821849	-3.857373346	1862.625	-0.53	-3.84	9.11756
-4.407					1986.51	3.97E-06	1930.34	9.39	26.48	-0.35			1860.75	-2.807788982	-3.613475546	1862.458	-0.28	-4.3	
-4.533					1986.494	4.14E-06	1930.25	9.34	27.12	-0.35			1860.58333	-3.238221915	-3.556884633	1862.291	-0.07	-4.76	
-4.666					1986.479	4.09E-06	1930.17	9.3	27.5	-0.35			1860.41667	-2.859744458	-3.772980997	1862.125	-0.1	-4.74	
-4.793					1986.464	4.09E-06	1930.09	9.34	27.12	-0.36			1860.25	-2.283238564	-3.884098276	1861.958	-0.3	-4.39	
-4.861					1986.449	4.19E-06	1930	9.38	26.55	-0.36			1860.08333	-2.194390594	-3.991885251	1861.791	-0.48	-4.1	
-4.832					1986.434	4.15E-06	1929.92	9.41	26.25	-0.36			1859.91667	-2.26985513	-4.035511584	1861.625	-0.47	-3.98	
-4.746					1986.419	4.4E-06	1929.84	9.47	25.44	-0.36			1859.75	-2.341679701	-3.670022167	1861.458	-0.33	-4.2	
-4.702					1986.403	4.48E-06	1929.75	9.51	25.05	-0.37			1859.58333	-2.786640164	-3.567767714	1861.291	-0.18	-4.51	
-4.64					1986.388	4.57E-06	1929.67	9.58	24.15	-0.37			1859.41667	-2.958245291	-3.758754627	1861.125	-0.02	-4.9	
-4.631					1986.373	4.39E-06	1929.59	9.56	24.41	-0.38			1859.25	-2.312259569	-3.984741157	1860.958	-0.33	-4.73	
-4.58					1986.358	4.4E-06	1929.5	9.52	24.82	-0.39			1859.08333	-2.049118541	-3.828065175	1860.791	-0.46	-4.49	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1860.583	-3.72						1914.2	0.32	-5.47	1975	-4.47754					1927.63
						1860.417	-3.67						1914.11	0.43	-5.32	1975.17	-4.50201					1927.54
						1860.25	-3.36						1914.02	0.09	-5.82	1975.33	-4.45929					1927.46
						1860.083	-3.05						1913.93	0.01	-6.09	1975.5	-4.39234					1927.38
						1859.917	-3.34						1913.75	-0.09	-6.17	1975.67	-4.34927					1927.29
						1859.75	-3.54						1913.68	-0.14	-6.02	1975.83	-4.31655					1927.21
						1859.583	-3.7						1913.62	-0.57	-6.18	1976	-4.27606					1927.13
						1859.417	-3.44						1913.55	0.08	-6.22	1976.17	-4.32935					1927.04
						1859.25	-3.2						1913.48	0.6	-5.66	1976.33	-4.55072					1926.96
						1859.083	-3.19						1913.42	0.41	-5.9	1976.5	-4.8621					1926.88
						1858.917	-3.48						1913.35	0.61	-5.62	1976.67	-4.97778					1926.79
						1858.75	-3.59						1913.28	0.65	-5.54	1976.83	-4.98903					1926.71
						1858.583	-3.46						1913.22	0.69	-5.3	1977	-4.95462					1926.63
						1858.417	-3.34						1913.15	0.58	-5.22	1977.17	-4.87173					1926.54
						1858.25	-3.23						1913.08	0.58	-5.41	1977.33	-4.79203					1926.46
						1858.083	-2.87						1913.02	0.19	-5.75	1977.5	-4.73306					1926.38
						1857.917	-3.27						1912.95	0.19	-5.84	1977.67	-4.83768					1926.29
						1857.75	-3.7						1912.88	0.39	-6.07	1977.83	-4.95766					1926.21
						1857.583	-3.71						1912.75	-0.02	-6.25	1978	-5.02575					1926.13
						1857.417	-3.42						1912.66	0.29	-5.88	1978.17	-5.06569					1926.04
						1857.25	-3.31						1912.57	-0.07	-6.12	1978.33	-4.77841					1925.96
						1857.083	-3.24						1912.48	0.33	-5.81	1978.5	-4.62554					1925.88
						1856.917	-3.65						1912.39	0.82	-5.65	1978.67	-4.62299					1925.79
						1856.75	-3.94						1912.3	0.54	-5.87	1978.83	-4.64368					1925.71
						1856.583	-3.71						1912.2	0.2	-5.33	1979	-4.71652					1925.63
						1856.417	-3.28						1912.11	0.04	-5.44	1979.17	-4.81011					1925.54
						1856.25	-3.27						1912.02	0.11	-5.64	1979.33	-4.73817					1925.46
						1856.083	-3.26						1911.93	0.06	-6.05	1979.5	-4.70264					1925.38
						1855.917	-3.75						1911.75	0.17	-6.41	1979.67	-4.77214					1925.29
						1855.75	-3.87						1911.68	0	-6.23	1979.83	-4.82839					1925.21
						1855.583	-3.82						1911.62	-0.1	-5.95	1980	-4.85719					1925.13
						1855.417	-3.58						1911.55	-0.13	-5.96	1980.17	-4.85764					1925.04
						1855.25	-3.16						1911.48	-0.08	-5.85	1980.33	-4.87922					1924.96
						1855.083	-3.07						1911.42	0.04	-5.58	1980.5	-4.97333					1924.88
						1854.917	-3.37						1911.35	-0.84	-5.27	1980.67	-5.02594					1924.79
						1854.75	-3.63						1911.28	-0.84	-5.45	1980.83	-5.05267					1924.71
						1854.583	-3.7						1911.22	0.17	-5.17	1981	-4.98802					1924.63
						1854.417	-3.63						1911.15	0.12	-6.06	1981.17	-5.01384					1924.54
						1854.25	-3.2						1911.08	-0.05	-5.8	1981.33	-5.0471					1924.46
						1854.083	-3						1911.02	-0.33	-6.15	1981.5	-4.96268					1924.38
						1853.917	-3.41						1910.95	-0.52	-5.88	1981.67	-4.80661					1924.29
						1853.75	-3.55						1910.88	-0.71	-6.24	1981.83	-4.82074					1924.21
						1853.583	-3.86						1910.75	-0.98	-6.6	1982	-4.81364					1924.13
						1853.417	-3.56						1910.67	-1.18	-6.22	1982.17	-4.8504					1924.04
						1853.25	-3.3						1910.6	-0.7	-6.23	1982.33	-4.85709					1923.96

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.503					1986.343	4.47E-06	1929.42	9.37	26.7	-0.39			1858.91667	-2.827177844	-3.422326408	1860.625	-0.4	-4.18	
-4.401					1986.328	4.75E-06	1929.34	9.33	27.14	-0.4			1858.75	-2.439368703	-3.297912664	1860.458	-0.41	-4.24	
-4.469					1986.313	4.62E-06	1929.25	9.31	27.4	-0.41			1858.58333	-2.25170266	-3.736712093	1860.291	-0.34	-4.52	
-4.706					1986.297	4.56E-06	1929.17	9.31	27.43	-0.42			1858.41667	-2.665356896	-3.543596567	1860.125	-0.45	-4.93	
-4.939					1986.282	4.62E-06	1929.09	9.33	27.18	-0.43			1858.25	-3.07912143	-4.025359998	1859.958	-0.81	-4.94	
-4.953					1986.267	4.46E-06	1929	9.4	26.34	-0.45			1858.08333	-2.457058172	-4.03923446	1859.791	-0.45	-4.48	
-4.778					1986.252	4.37E-06	1928.92	9.48	25.34	-0.46			1857.91667	-2.302097933	-4.024579697	1859.625	-0.24	-4.02	
-4.755					1986.237	4.44E-06	1928.84	9.51	25.03	-0.47			1857.75	-2.621060178	-3.459939622	1859.458	-0.47	-4.16	
-4.741					1986.222	4.38E-06	1928.75	9.55	24.5	-0.49			1857.58333	-3.184942736	-3.803792779	1859.291	-0.42	-4.7	
-4.697					1986.207	4.45E-06	1928.67	9.61	23.79	-0.5			1857.41667	-2.850511234	-3.940189888	1859.125	-0.34	-4.93	
-4.653					1986.191	4.54E-06	1928.59	9.57	24.29	-0.52			1857.25	-2.417505308	-3.964432257	1858.958	-0.33	-4.8	
-4.591					1986.176	4.51E-06	1928.5	9.52	24.94	-0.53			1857.08333	-2.277780631	-4.012846224	1858.791	-0.39	-4.52	
-4.496					1986.161	4.67E-06	1928.42	9.51	25	-0.55			1856.91667	-2.181662089	-3.870422432	1858.625	-0.34	-4.09	
-4.471					1986.146	4.98E-06	1928.34	9.5	25.17	-0.56			1856.75	-2.672860946	-3.58888117	1858.458	-0.81	-4.37	
-4.607					1986.131	5.26E-06	1928.25	9.41	26.16	-0.58			1856.58333	-2.883729819	-3.692248005	1858.291	-0.42	-4.75	
-4.775					1986.116	5.18E-06	1928.17	9.41	26.17	-0.59			1856.41667	-2.764388334	-3.895728654	1858.125	-0.41	-5.02	
-4.958					1986.1	5.22E-06	1928.09	9.44	25.8	-0.61			1856.25	-2.490275501	-4.102100959	1857.958	-0.56	-4.71	
-4.949					1986.085	4.73E-06	1928	9.46	25.67	-0.62			1856.08333	-2.146996875	-4.187794605	1857.791	-0.64	-4.26	
-4.919					1986.07	4.76E-06	1927.92	9.47	25.44	-0.64			1855.91667	-2.10135931	-3.944244155	1857.625	-0.45	-4.13	
-4.805					1986.055	4.88E-06	1927.84	9.53	24.71	-0.65			1855.75	-2.551664222	-3.463098716	1857.458	-0.24	-4.7	
-4.684					1986.04	4.73E-06	1927.75	9.59	24.09	-0.67			1855.58333	-2.727160753	-3.671365439	1857.291	-0.19	-4.94	
-4.676					1986.025	4.34E-06	1927.67	9.63	23.55	-0.68			1855.41667	-2.094154715	-3.987007202	1857.125	-0.26	-4.9	
-4.663					1986.01	3.92E-06	1927.59	9.6	23.95	-0.7			1855.25	-2.542049191	-3.74018757	1856.958	-0.39	-4.69	
-4.576					1985.994	4.12E-06	1927.5	9.57	24.27	-0.71			1855.08333	-2.974549517	-3.632875685	1856.791	-0.51	-4.44	
-4.541					1985.979	3.93E-06	1927.42	9.53	24.71	-0.72			1854.91667	-2.347761997	-3.996693941	1856.625	-0.55	-4.2	
-4.496					1985.964	4.2E-06	1927.34	9.48	25.32	-0.73			1854.75	-2.831134405	-3.660445936	1856.458	-0.84	-4.58	
-4.492					1985.949	3.8E-06	1927.25	9.35	26.89	-0.75			1854.58333	-3.493363337	-3.546969234	1856.291	-0.52	-5.12	
-4.541					1985.934	3.65E-06	1927.17	9.36	26.83	-0.76			1854.41667	-3.387333628	-3.525914529	1856.125	-0.49	-5.15	
-4.593					1985.919	3.8E-06	1927.09	9.35	26.93	-0.77			1854.25	-3.281303918	-3.504859824	1855.958	-0.6	-4.75	
-4.617					1985.903	3.69E-06	1927	9.38	26.6	-0.78			1854.08333	-3.175274209	-3.483805119	1855.791	-0.5	-4.36	
-4.594					1985.888	3.8E-06	1926.92	9.54	24.64	-0.79			1853.91667	-3.0692445	-3.462750414	1855.625	-0.54	-4.13	
-4.576					1985.873	3.95E-06	1926.84	9.57	24.23	-0.8			1853.75	-2.963214791	-3.441695709	1855.458	-0.78	-4.33	
-4.616					1985.858	3.8E-06	1926.75	9.62	23.7	-0.81			1853.58333	-2.733194895	-3.659386143	1855.291	-0.58	-4.77	
-4.627					1985.843	3.73E-06	1926.67	9.66	23.18	-0.81			1853.41667	-2.454290609	-3.545777559	1855.125	-0.23	-4.97	
-4.627					1985.828	3.92E-06	1926.59	9.64	23.42	-0.82			1853.25	-2.942287071	-3.929937949	1854.958	-0.6	-4.41	
-4.586					1985.813	3.95E-06	1926.5	9.55	24.5	-0.83			1853.08333	-2.789199086	-3.90163394	1854.791	-0.31	-4.11	
-4.463					1985.797	3.94E-06	1926.42	9.5	25.07	-0.83			1852.91667	-2.305300874	-3.917786157	1854.625	-0.63	-3.88	
-4.32					1985.782	0.000004	1926.34	9.47	25.5	-0.83			1852.75	-2.70049776	-3.682615381	1854.458	-0.25	-4.45	
-4.458					1985.767	3.98E-06	1926.25	9.46	25.64	-0.83			1852.58333	-2.719113904	-3.852933677	1854.291	-0.08	-4.85	
-4.656					1985.752	3.96E-06	1926.17	9.47	25.52	-0.84			1852.41667	-2.547903155	-4.003178141	1854.125	-0.29	-4.74	
-4.807					1985.737	4.01E-06	1926.09	9.51	25.02	-0.84			1852.25	-2.222719668	-4.039822545	1853.958	-0.48	-4.36	
-4.858					1985.722	3.85E-06	1926	9.54	24.6	-0.83			1852.08333	-2.102625848	-4.131372422	1853.791	-0.36	-4.09	
-4.78					1985.707	3.85E-06	1925.92	9.56	24.44	-0.83			1851.91667	-2.17351506	-4.006959008	1853.625	-0.49	-3.99	
-4.627					1985.691	3.87E-06	1925.84	9.58	24.13	-0.83			1851.75	-2.541045838	-3.677969779	1853.458	-0.44	-4.4	
-4.676					1985.676	3.76E-06	1925.75	9.59	23.99	-0.83			1851.58333	-3.075027265	-3.714836357	1853.291	-0.22	-4.81	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1853.083	-2.98						1910.52	-0.99	-6.21	1982.5	-4.99148					1923.88
						1852.917	-3.31						1910.44	-0.37	-6.21	1982.67	-5.164					1923.79
						1852.75	-3.61						1910.37	-0.22	-6.12	1982.83	-5.2398					1923.71
						1852.583	-3.69						1910.29	0.06	-5.87	1983	-5.08795					1923.63
						1852.417	-3.22						1910.21	-0.01	-5.66	1983.17	-4.78105					1923.54
						1852.25	-2.88						1910.13	0.01	-5.52	1983.33	-4.83419					1923.46
						1852.083	-2.92						1910.06	-0.19	-5.47	1983.5	-4.86522					1923.38
						1851.917	-3.39						1909.98	-0.32	-5.71	1983.67	-4.74766					1923.29
						1851.75	-3.6						1909.9	0.04	-5.88	1983.83	-4.70014					1923.21
						1851.583	-3.88						1909.75	0.1	-6.08	1984	-4.56099					1923.13
						1851.417	-3.5						1909.67	0.17	-6	1984.17	-4.58361					1923.04
						1851.25	-3.12						1909.6	-0.14	-6	1984.33	-4.70705					1922.96
						1851.083	-2.95						1909.52	-0.1	-5.87	1984.5	-4.79235					1922.88
						1850.917	-3.3						1909.44	0.22	-5.78	1984.67	-4.76538					1922.79
						1850.75	-3.6						1909.37	0.34	-5.62	1984.83	-4.7536					1922.71
						1850.583	-3.75						1909.29	0.26	-5.49	1985	-4.70801					1922.63
						1850.417	-3.75						1909.21	0.03	-5.53	1985.17	-4.62773					1922.54
						1850.25	-3.3						1909.13	0.12	-5.05	1985.33	-4.6608					1922.46
						1850.083	-3.04						1909.06	-0.3	-5.88	1985.5	-4.69645					1922.38
						1849.917	-3.46						1908.98	-0.52	-5.99	1985.67	-4.68331					1922.29
						1849.75	-3.54						1908.9	-0.74	-6.15	1985.83	-4.7498					1922.21
						1849.583	-3.6						1908.75	-1.22	-6.25	1986	-4.76513					1922.13
						1849.417	-3.38						1908.67	-0.79	-6.17	1986.17	-4.67847					1922.04
						1849.25	-2.96						1908.58	-0.38	-6.2	1986.33	-4.68102					1921.96
						1849.083	-3						1908.5	0.07	-6.07	1986.5	-4.72568					1921.88
						1848.917	-3.41						1908.42	-0.2	-5.74	1986.67	-4.83493					1921.79
						1848.75	-3.78						1908.33	-0.31	-5.46	1986.83	-4.96524					1921.71
						1848.583	-3.73						1908.25	0.77	-5.07	1987	-5.07148					1921.63
						1848.417	-3.68						1908.17	0.25	-5.1	1987.17	-5.0598					1921.54
						1848.25	-3.47						1908.08	0.33	-5.29	1987.33	-5.09706					1921.46
						1848.083	-3.3						1908	-0.08	-5.63	1987.5	-5.2768					1921.38
						1847.917	-3.8						1907.92	-0.67	-5.85	1987.67	-5.30443					1921.29
						1847.75	-3.67						1907.75	-0.87	-5.95	1987.83	-5.18609					1921.21
						1847.583	-3.51						1907.68	-0.3	-5.92	1988	-5.03899					1921.13
						1847.417	-3.36						1907.61	-0.53	-5.77	1988.17	-4.87811					1921.04
						1847.25	-3.12						1907.54	-0.51	-5.88	1988.33	-4.68045					1920.96
						1847.083	-3.07						1907.46	-0.29	-5.78	1988.5	-4.49724					1920.88
						1846.917	-3.67						1907.39	-0.24	-5.47	1988.67	-4.46983					1920.79
						1846.75	-3.66						1907.32	-0.13	-5.62	1988.83	-4.48363					1920.71
						1846.583	-3.72						1907.25	-0.03	-5.32	1989	-4.48843					1920.63
						1846.417	-3.5						1907.18	-0.21	-5.63	1989.17	-4.50704					1920.54
						1846.25	-3.06						1907.11	-0.26	-5.6	1989.33	-4.54648					1920.46
						1846.083	-2.98						1907.04	-0.18	-5.54	1989.5	-4.56043					1920.38
						1845.917	-3.24						1906.96	-0.41	-5.83	1989.67	-4.59001					1920.29
						1845.75	-3.46						1906.89	-0.64	-6.2	1989.83	-4.63121					1920.21

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.613					1985.661	3.86E-06	1925.67	9.64	23.42	-0.82			1851.41667	-2.623954028	-4.067176151	1853.125	-0.34	-4.72	
-4.606					1985.646	3.8E-06	1925.59	9.68	22.99	-0.81			1851.25	-2.194742421	-4.000406916	1852.958	-0.66	-4.37	
-4.489					1985.631	3.97E-06	1925.5	9.57	24.25	-0.81			1851.08333	-2.337724539	-3.993279032	1852.791	-0.87	-4.18	
-4.436					1985.616	4.07E-06	1925.42	9.57	24.27	-0.8			1850.91667	-2.564215436	-3.820539141	1852.625	-0.92	-4.06	
-4.425					1985.6	4.17E-06	1925.34	9.32	27.28	-0.79			1850.75	-2.735213387	-3.585323541	1852.458	-0.66	-4.34	
-4.45					1985.585	4.2E-06	1925.25	9.34	27.07	-0.78			1850.58333	-2.677351697	-3.682435879	1852.291	-0.59	-4.76	
-4.6					1985.57	4.31E-06	1925.17	9.4	26.3	-0.77			1850.41667	-2.172627432	-3.868434294	1852.125	-0.55	-4.73	
-4.846					1985.555	4.09E-06	1925.09	9.39	26.46	-0.76			1850.25	-2.324827495	-3.961974768	1851.958	-0.51	-4.42	
-4.899					1985.538	4.19E-06	1925	9.41	26.19	-0.75			1850.08333	-2.283037273	-3.904966545	1851.791	-0.48	-4.27	
-4.736					1985.522	4.23E-06	1924.92	9.45	25.77	-0.73			1849.91667	-2.485372273	-3.935736997	1851.625	-0.53	-4.26	
-4.715					1985.505	4.03E-06	1924.84	9.54	24.66	-0.72			1849.75	-2.935887431	-3.707759453	1851.458	-0.45	-4.4	
-4.679					1985.488	4.04E-06	1924.75	9.63	23.59	-0.71			1849.58333	-2.868484719	-3.902685067	1851.291	-0.3	-4.48	
-4.689					1985.472	4.15E-06	1924.67	9.64	23.42	-0.7			1849.41667	-2.512372425	-4.156730111	1851.125	-0.23	-4.68	
-4.605					1985.455	4.2E-06	1924.59	9.55	24.46	-0.68			1849.25	-2.333254419	-4.001420578	1850.958	-0.23	-4.69	
-4.529					1985.438	4.16E-06	1924.5	9.49	25.23	-0.67			1849.08333	-2.366689069	-3.882531592	1850.791	-0.33	-4.25	
-4.471					1985.422	4.14E-06	1924.42	9.46	25.65	-0.65			1848.91667	-2.520666164	-3.643902322	1850.625	-0.71	-3.67	
-4.335					1985.405	4.19E-06	1924.34	9.42	26.08	-0.64			1848.75	-3.230547064	-3.497853412	1850.458	-0.72	-4.1	
-4.44					1985.388	4.24E-06	1924.25	9.4	26.4	-0.62			1848.58333	-3.157984504	-3.647630429	1850.291	-1.04	-4.44	
-4.541					1985.372	4.15E-06	1924.17	9.48	25.42	-0.6			1848.41667	-2.584299707	-3.745125509	1850.125	-0.94	-4.79	
-4.753					1985.355	4.24E-06	1924.09	9.59	24.08	-0.59			1848.25	-2.249053568	-3.758715814	1849.958	-0.6	-4.74	
-4.817					1985.338	4.25E-06	1924	9.57	24.25	-0.57			1848.08333	-2.85511612	-3.662703847	1849.791	-0.45	-4.16	
-4.803					1985.322	3.97E-06	1923.92	9.54	24.67	-0.55			1847.91667	-3.384501935	-3.360590975	1849.625	-0.55	-3.94	
-4.794					1985.305	4.36E-06	1923.84	9.53	24.7	-0.54			1847.75	-2.861073872	-3.355774701	1849.458	-0.91	-3.97	
-4.766					1985.288	4.47E-06	1923.75	9.59	23.99	-0.52			1847.58333	-3.535434882	-3.736075149	1849.291	-0.61	-4.64	
-4.65					1985.272	4.22E-06	1923.67	9.58	24.15	-0.5			1847.41667	-2.289541456	-3.922302099	1849.125	-0.38	-4.97	
-4.546					1985.255	4.2E-06	1923.59	9.56	24.44	-0.48			1847.25	-2.805600398	-3.673532298	1848.958	-0.43	-4.6	
-4.442					1985.238	3.95E-06	1923.5	9.46	25.57	-0.47			1847.08333	-2.854389898	-4.227964046	1848.791	-0.43	-4.17	
-4.339					1985.222	3.88E-06	1923.42	9.4	26.31	-0.45			1846.91667	-2.344509491	-3.982275001	1848.625	-0.46	-3.79	
-4.288					1985.205	3.95E-06	1923.34	9.39	26.43	-0.43			1846.75	-2.682023672	-3.496147032	1848.458	-1.2	-4.4	
-4.351					1985.188	3.71E-06	1923.25	9.36	26.81	-0.41			1846.58333	-2.972265556	-3.698324441	1848.291	-0.79	-4.82	
-4.669					1985.172	3.79E-06	1923.17	9.39	26.44	-0.4			1846.41667	-3.074400552	-3.934443703	1848.125	-0.24	-4.74	
-4.755					1985.155	3.83E-06	1923.09	9.42	26.15	-0.38			1846.25	-2.720288152	-4.049661464	1847.958	-0.1	-4.34	
-4.718					1985.138	3.97E-06	1923	9.44	25.91	-0.37			1846.08333	-2.250688244	-3.920047349	1847.791	-0.42	-3.91	
-4.717					1985.122	3.98E-06	1922.92	9.45	25.7	-0.35			1845.91667	-2.312089783	-3.737138102	1847.625	-0.88	-3.88	
-4.695					1985.105	3.84E-06	1922.84	9.46	25.55	-0.34			1845.75	-2.520544589	-3.411203356	1847.458	-0.99	-4.25	
-4.588					1985.088	3.74E-06	1922.75	9.49	25.23	-0.33			1845.58333	-3.282309005	-3.881401439	1847.291	-0.85	-4.56	
-4.473					1985.072	3.64E-06	1922.67	9.53	24.76	-0.31			1845.41667	-3.247272742	-4.234011795	1847.125	-0.45	-4.83	
-4.487					1985.055	3.62E-06	1922.59	9.53	24.72	-0.3			1845.25	-2.723662772	-4.078469915	1846.958	-0.37	-4.44	
-4.553					1985.038	3.62E-06	1922.5	9.48	25.34	-0.29			1845.08333	-2.789305238	-3.92936662	1846.791	-0.41	-4.08	
-4.525					1985.022	3.79E-06	1922.42	9.37	26.7	-0.28			1844.91667	-2.696814118	-3.79789627	1846.625	-0.57	-3.76	
-4.434					1985.005	3.98E-06	1922.34	9.31	27.42	-0.27			1844.75	-2.869280566	-3.673176919	1846.458	-1.39	-4.19	
-4.653					1984.988	4.02E-06	1922.25	9.31	27.43	-0.27			1844.58333	-3.869471016	-3.995832714	1846.291	-0.91	-4.66	
-4.854					1984.972	4.1E-06	1922.17	9.39	26.5	-0.26			1844.41667	-3.057672725	-3.932066835	1846.125	-0.54	-4.66	
-4.891					1984.955	4.09E-06	1922.09	9.41	26.16	-0.25			1844.25	-2.827438596	-3.956664803	1845.958	-0.48	-4.35	
-4.861					1984.938	3.81E-06	1922	9.43	25.99	-0.25			1844.08333	-2.468767927	-3.759190883	1845.791	-0.58	-4.11	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1845.583	-3.65						1906.75	-0.96	-6.39	1990	-4.77761					1920.13
						1845.417	-3.67						1906.68	-0.88	-6.3	1990.17	-5.04868					1920.04
						1845.25	-3.46						1906.61	-0.82	-6.24	1990.33	-5.01844					1919.96
						1845.083	-3.39						1906.54	-0.7	-6.11	1990.5	-4.80892					1919.88
						1844.917	-3.41						1906.46	-0.58	-5.98	1990.67	-4.86757					1919.79
						1844.75	-3.84						1906.39	-0.7	-6.17	1990.83	-5.01768					1919.71
						1844.583	-3.92						1906.32	-0.62	-5.92	1991	-5.1529					1919.63
						1844.417	-3.75						1906.25	-0.35	-5.68	1991.17	-5.16222					1919.54
						1844.25	-3.28						1906.18	-0.15	-5.52	1991.33	-5.04997					1919.46
						1844.083	-2.79						1906.11	-0.23	-5.54	1991.5	-5.07075					1919.38
						1843.917	-3.1						1906.04	-0.43	-5.46	1991.67	-5.09249					1919.29
						1843.75	-3.3						1905.96	-0.48	-5.61	1991.83	-4.97454					1919.21
						1843.583	-3.29						1905.89	-0.58	-5.85	1992	-4.88077					1919.13
						1843.417	-3.08						1905.75	-0.77	-6.17	1992.17	-4.85192					1919.04
						1843.25	-3						1905.68	-1.22	-6.22	1992.33	-5.13784					1918.96
						1843.083	-3.06						1905.62	-1.27	-6.14	1992.5	-4.9788					1918.88
						1842.917	-3.48						1905.55	-0.99	-6.08	1992.67	-4.63502					1918.79
						1842.75	-3.6						1905.48	-0.01	-6.04	1992.83	-4.62057					1918.71
						1842.583	-3.6						1905.42	0.13	-6.04	1993	-4.71623					1918.63
						1842.417	-3.4						1905.35	-0.17	-6.04	1993.17	-4.79548					1918.54
						1842.25	-3.09						1905.28	-0.22	-5.95	1993.33	-4.86926					1918.46
						1842.083	-2.83						1905.22	-0.16	-5.9	1993.5	-4.83694					1918.38
						1841.917	-3.09						1905.15	-0.37	-6	1993.67	-5.09007					1918.29
						1841.75	-3.41						1905.08	-0.37	-5.97	1993.83	-5.0886					1918.21
						1841.583	-3.74						1905.02	-0.36	-6.04	1994	-4.85999					1918.13
						1841.417	-3.34						1904.95	-0.48	-6.11	1994.17	-4.69942					1918.04
						1841.25	-2.99						1904.88	-0.88	-6.31	1994.33	-4.725					1917.96
						1841.083	-2.87						1904.75	-1.2	-6.34	1994.5	-4.80113					1917.88
						1840.917	-3.33						1904.67	-1.6	-6.47							1917.79
						1840.75	-3.58						1904.6	-1.31	-6.33							1917.71
						1840.583	-3.7						1904.52	-1.51	-6.4							1917.63
						1840.417	-3.46						1904.44	-0.81	-5.96							1917.54
						1840.25	-3.06						1904.37	-1	-6.21							1917.46
						1840.083	-2.83						1904.29	-0.71	-6.09							1917.38
						1839.917	-3.12						1904.21	-0.31	-5.76							1917.29
						1839.75	-3.58						1904.13	-0.03	-5.55							1917.21
						1839.583	-3.57						1904.06	0.36	-5.41							1917.13
						1839.417	-3.28						1903.98	0.44	-5.75							1917.04
						1839.25	-2.74						1903.9	0.74	-5.73							1916.96
						1839.083	-2.78						1903.75	0.9	-6.11							1916.88
						1838.917	-3.22						1903.65	0.48	-6.22							1916.79
						1838.75	-3.52						1903.55	0.43	-6.13							1916.71
						1838.583	-3.69						1903.45	0.29	-5.95							1916.63
						1838.417	-3.55						1903.35	0.38	-5.74							1916.54
						1838.25	-3.25						1903.25	0.47	-5.76							1916.46

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.793					1984.922	3.86E-06	1921.92	9.51	25.06	-0.24			1843.91667	-2.758790742	-3.708160301	1845.625	-1.08	-4.05	
-4.734					1984.905	4.01E-06	1921.84	9.54	24.59	-0.24			1843.75	-2.947905806	-3.527152011	1845.458	-0.79	-4.53	
-4.633					1984.888	4.1E-06	1921.75	9.59	24.03	-0.24			1843.58333	-3.158346069	-3.848015398	1845.291	-0.6	-4.84	
-4.611					1984.872	4.13E-06	1921.67	9.55	24.52	-0.24			1843.41667	-2.70282526	-3.991685419	1845.125	-0.5	-4.97	
-4.62					1984.855	4.06E-06	1921.59	9.51	25.02	-0.24			1843.25	-2.448256842	-4.128691307	1844.958	-0.33	-4.69	
-4.528					1984.838	3.88E-06	1921.5	9.43	25.92	-0.24			1843.08333	-2.354997611	-3.92746539	1844.791	-0.19	-4.35	
-4.467					1984.822	3.82E-06	1921.42	9.35	26.95	-0.24			1842.91667	-3.048421228	-3.713490291	1844.625	-0.09	-3.94	
-4.413					1984.805	3.79E-06	1921.34	9.31	27.45	-0.24			1842.75	-2.948416812	-3.511693882	1844.458	-0.55	-4.28	
-4.557					1984.788	3.63E-06	1921.25	9.31	27.48	-0.24			1842.58333	-2.828622573	-3.607635733	1844.291	-0.32	-4.73	
-4.898					1984.772	3.73E-06	1921.17	9.33	27.16	-0.24			1842.41667	-2.538168164	-3.904861784	1844.125	-0.15	-4.87	
-5.06					1984.755	3.59E-06	1921.09	9.37	26.76	-0.25			1842.25	-2.406834591	-3.911444192	1843.958	-0.14	-4.7	
-5					1984.738	3.6E-06	1921	9.4	26.36	-0.25			1842.08333	-2.175139873	-3.661788782	1843.791	-0.21	-4.41	
-4.81					1984.722	3.61E-06	1920.92	9.54	24.59	-0.26			1841.91667	-2.288696253	-3.504788283	1843.625	-0.43	-4.15	
-4.594					1984.705	3.74E-06	1920.84	9.56	24.38	-0.26			1841.75	-2.354391597	-3.331023303	1843.458	-0.8	-4.27	
-4.513					1984.688	3.84E-06	1920.75	9.56	24.4	-0.27			1841.58333	-2.519342531	-3.394876222	1843.291	-0.75	-4.71	
-4.455					1984.672	3.75E-06	1920.67	9.62	23.67	-0.27			1841.41667	-2.772284639	-3.65726555	1843.125	-0.5	-4.93	
-4.464					1984.655	3.75E-06	1920.59	9.58	24.19	-0.28			1841.25	-2.515585714	-3.964816077	1842.958	-0.4	-4.72	
-4.446					1984.638	3.94E-06	1920.5	9.51	25.03	-0.28			1841.08333	-2.170565838	-4.076951675	1842.791	-0.58	-4.36	
-4.387					1984.622	3.88E-06	1920.42	9.47	25.43	-0.29			1840.91667	-2.108820642	-4.006878678	1842.625	-0.62	-3.87	
-4.386					1984.605	3.97E-06	1920.34	9.41	26.22	-0.3			1840.75	-2.153633261	-3.654304042	1842.458	-0.29	-4.38	
-4.491					1984.588	4.01E-06	1920.25	9.36	26.78	-0.3			1840.58333	-2.674291322	-3.604194135	1842.291	-0.45	-4.95	
-4.667					1984.572	4.14E-06	1920.17	9.36	26.77	-0.31			1840.41667	-2.925046684	-3.644429178	1842.125	-0.37	-4.74	
-4.769					1984.555	4.2E-06	1920.09	9.39	26.46	-0.32			1840.25	-2.557785239	-3.716360179	1841.958	-0.5	-4.38	
-4.638					1984.536	4.13E-06	1920	9.41	26.22	-0.32			1840.08333	-2.368546889	-3.673565349	1841.791	-0.52	-4.09	
-4.523					1984.517	4.02E-06	1919.92	9.46	25.65	-0.33			1839.91667	-2.650757784	-3.539101449	1841.625	-0.59	-3.93	
-4.488					1984.498	4.09E-06	1919.84	9.56	24.34	-0.33			1839.75	-2.99394733	-3.366078221	1841.458	-0.3	-4.47	
-4.509					1984.48	0.000004	1919.75	9.62	23.67	-0.34			1839.58333	-2.887128788	-3.536446503	1841.291	-0.4	-4.85	
-4.565					1984.461	4.15E-06	1919.67	9.67	23.06	-0.35			1839.41667	-2.621678827	-3.750869575	1841.125	-0.28	-4.96	
-4.524					1984.442	4.05E-06	1919.59	9.57	24.27	-0.35			1839.25	-2.324067756	-3.900452479	1840.958	0	-4.75	
-4.485					1984.423	4.37E-06	1919.5	9.57	24.27	-0.36			1839.08333	-2.30633439	-3.937737692	1840.791	0.07	-4.31	
-4.431					1984.404	4.4E-06	1919.42	9.46	25.58	-0.36			1838.91667	-2.349511418	-3.629158139	1840.625	-0.52	-3.96	
-4.471					1984.385	4.26E-06	1919.34	9.4	26.32	-0.37			1838.75	-2.816742205	-3.339819612	1840.458	-0.66	-4.07	
-4.509					1984.366	4.26E-06	1919.25	9.39	26.49	-0.37			1838.58333	-2.849727287	-3.438799014	1840.291	-0.57	-4.38	
-4.553					1984.347	4.38E-06	1919.17	9.41	26.18	-0.37			1838.41667	-2.855804226	-3.845782782	1840.125	-0.39	-5.22	
-4.637					1984.329	4.85E-06	1919.09	9.42	26.07	-0.38			1838.25	-2.826019803	-4.027174208	1839.958	0.12	-4.53	
-4.659					1984.31	5.11E-06	1919	9.41	26.25	-0.38			1838.08333	-2.510509013	-3.971023518	1839.791	-0.34	-4.23	
-4.675					1984.291	5.25E-06	1918.92	9.42	26.07	-0.39			1837.91667	-3.23475874	-3.428477671	1839.625	-0.5	-4.22	
-4.606					1984.272	5.24E-06	1918.84	9.52	24.93	-0.39			1837.75	-2.940833546	-3.362032193	1839.458	-0.16	-4.56	
-4.543					1984.253	5.47E-06	1918.75	9.61	23.77	-0.4			1837.58333	-3.145393367	-3.815446701	1839.291	-0.13	-4.93	
-4.53					1984.234	5.52E-06	1918.67	9.63	23.55	-0.4			1837.41667	-2.704864899	-3.867308961	1839.125	-0.11	-4.85	
-4.518					1984.215	5.47E-06	1918.59	9.64	23.44	-0.4			1837.25	-2.168106348	-3.747410648	1838.958	-0.18	-4.5	
-4.507					1984.197	5.55E-06	1918.5	9.58	24.13	-0.41			1837.08333	-2.614098486	-3.4880205	1838.791	-0.42	-4.24	
-4.434					1984.178	5.66E-06	1918.42	9.48	25.37	-0.41			1836.91667	-3.037041004	-3.511122836	1838.625	-0.51	-3.96	
-4.369					1984.159	5.85E-06	1918.34	9.43	26.03	-0.42			1836.75	-2.545027464	-3.388910361	1838.458	-0.52	-4.29	
-4.39					1984.14	6.15E-06	1918.25	9.34	27.04	-0.42			1836.58333	-2.661395919	-3.432869923	1838.291	-0.36	-4.68	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1838.083	-2.99						1903.15	0.85	-5.56							1916.38
						1837.917	-3.07						1903.05	0.54	-5.78							1916.29
						1837.75	-3.25						1902.95	-0.03	-6.31							1916.21
						1837.583	-3.48						1902.75	0.05	-6.22							1916.13
						1837.417	-3.54						1902.64	0.72	-6.04							1916.04
						1837.25	-3.1						1902.53	0.82	-5.87							1915.96
						1837.083	-2.67						1902.42	0.46	-5.24							1915.88
						1836.917	-3.06						1902.31	0.62	-5.19							1915.79
						1836.75	-3.58						1902.19	0.55	-5.29							1915.71
						1836.583	-3.52						1902.08	0.27	-5.7							1915.63
						1836.417	-3.15						1901.97	0.04	-5.98							1915.54
						1836.25	-2.85						1901.75	0	-6.03							1915.46
						1836.083	-2.83						1901.67	-0.23	-5.91							1915.38
						1835.917	-3.4						1901.58	-0.45	-5.91							1915.29
						1835.75	-3.36						1901.5	-0.52	-5.79							1915.21
						1835.583	-3.11						1901.42	-0.35	-5.83							1915.13
						1835.417	-2.9						1901.33	0.24	-5.52							1915.04
						1835.25	-2.74						1901.25	0.27	-5.46							1914.96
						1835.083	-2.76						1901.17	0.36	-5.55							1914.88
						1834.917	-3.1						1901.08	0.32	-5.37							1914.79
						1834.75	-3.24						1901	0.08	-4.89							1914.71
						1834.583	-3.24						1900.92	-0.13	-5.47							1914.63
						1834.417	-3.43						1900.75	-0.34	-6.32							1914.54
						1834.25	-2.84						1900.7	-0.75	-6.18							1914.46
						1834.083	-2.64						1900.64	-0.61	-6.02							1914.38
						1833.917	-3.17						1900.59	-0.69	-5.92							1914.29
						1833.75	-3.43						1900.54	0.03	-6.21							1914.21
						1833.583	-3.34						1900.49	-0.08	-6.17							1914.13
						1833.417	-3.16						1900.43	-0.08	-5.99							1914.04
						1833.25	-2.98						1900.38	-0.03	-5.82							1913.96
						1833.083	-3						1900.33	0.18	-5.68							1913.88
						1832.917	-3.31						1900.28	0.23	-5.49							1913.79
						1832.75	-3.5						1900.22	0.26	-5.61							1913.71
						1832.583	-3.38						1900.17	-0.03	-5.89							1913.63
						1832.417	-3.05						1900.12	-0.05	-5.99							1913.54
						1832.25	-2.85						1900.07	-0.17	-6.14							1913.46
						1832.083	-2.87						1900.01	-0.33	-6.09							1913.38
						1831.917	-3.2						1899.96	-0.57	-6.22							1913.29
						1831.75	-3.56						1899.91	-0.49	-6.39							1913.21
						1831.583	-3.69						1899.86	-0.34	-6.31							1913.13
						1831.417	-3.45						1899.75	-0.33	-6.49							1913.04
						1831.25	-3.03						1899.66	-0.45	-6.38							1912.96
						1831.083	-3.02						1899.57	-0.21	-6.16							1912.88
						1830.917	-3.55						1899.48	0.37	-5.81							1912.79
						1830.75	-3.42						1899.39	0.43	-5.61							1912.71

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.544					1984.121	5.91E-06	1918.17	9.31	27.47	-0.42			1836.41667	-2.529376066	-3.680927999	1838.125	-0.18	-4.74	
-4.796					1984.102	5.49E-06	1918.09	9.32	27.31	-0.43			1836.25	-2.420534744	-3.976740847	1837.958	-0.09	-4.47	
-4.918					1984.083	5.11E-06	1918	9.37	26.73	-0.44			1836.08333	-2.390544448	-4.136657105	1837.791	-0.2	-4.08	
-4.792					1984.064	4.47E-06	1917.92	9.45	25.7	-0.44			1835.91667	-2.520938507	-3.915815655	1837.625	-0.63	-3.9	
-4.771					1984.046	0.000004	1917.84	9.53	24.77	-0.45			1835.75	-2.675044812	-3.474428468	1837.458	-0.66	-4.53	
-4.788					1984.027	4.07E-06	1917.75	9.56	24.44	-0.46			1835.58333	-2.486678487	-3.521247079	1837.291	-0.64	-4.81	
-4.771					1984.008	4.08E-06	1917.67	9.53	24.76	-0.46			1835.41667	-2.758474205	-3.877750053	1837.125	-0.58	-4.72	
-4.726					1983.989	4.17E-06	1917.59	9.55	24.52	-0.47			1835.25	-2.385736708	-4.178200756	1836.958	-0.4	-4.48	
-4.689					1983.97	3.93E-06	1917.5	9.53	24.71	-0.48			1835.08333	-2.22021747	-4.336618721	1836.791	-0.35	-4.2	
-4.53					1983.951	3.79E-06	1917.42	9.46	25.55	-0.49			1834.91667	-2.871844481	-4.102617063	1836.625	-0.41	-3.87	
-4.44					1983.932	3.67E-06	1917.34	9.42	26.06	-0.5			1834.75	-2.76223797	-3.452220044	1836.458	-0.59	-3.95	
-4.555					1983.913	3.71E-06	1917.25	9.4	26.39	-0.51			1834.58333	-2.370852577	-3.768725634	1836.291	-0.57	-4.27	
-4.784					1983.895	3.95E-06	1917.17	9.32	27.36	-0.52			1834.41667	-2.47021715	-4.037375194	1836.125	-0.38	-4.65	
-4.917					1983.876	3.85E-06	1917.09	9.36	26.83	-0.53			1834.25	-2.589954772	-3.970316987	1835.958	-0.23	-4.69	
-4.896					1983.857	3.8E-06	1917	9.42	26.07	-0.55			1834.08333	-2.954055432	-3.727053149	1835.791	-0.35	-4.27	
-4.785					1983.838	3.88E-06	1916.92	9.47	25.47	-0.56			1833.91667	-2.877044352	-3.632781422	1835.625	-0.77	-3.94	
-4.702					1983.819	3.88E-06	1916.84	9.58	24.21	-0.57			1833.75	-2.806850573	-3.459136185	1835.458	-0.76	-4.08	
-4.715					1983.8	3.99E-06	1916.75	9.56	24.38	-0.59			1833.58333	-2.687948738	-3.670934037	1835.291	-0.36	-4.71	
-4.63					1983.781	4.1E-06	1916.67	9.59	24.03	-0.6			1833.41667	-2.518580004	-3.804876406	1835.125	-0.31	-4.9	
-4.636					1983.763	4.02E-06	1916.59	9.62	23.69	-0.61			1833.25	-2.294101626	-3.764661775	1834.958	-0.44	-4.67	
-4.741					1983.744	4.01E-06	1916.5	9.58	24.16	-0.63			1833.08333	-2.597094811	-3.921617043	1834.791	-0.5	-4.19	
-4.612					1983.725	3.88E-06	1916.42	9.49	25.21	-0.64			1832.91667	-2.787425473	-3.906456	1834.625	-0.63	-4.12	
-4.391					1983.706	3.94E-06	1916.34	9.42	26.05	-0.66			1832.75	-2.633679248	-3.495242422	1834.458	-0.24	-4.4	
-4.51					1983.687	3.91E-06	1916.25	9.4	26.37	-0.68			1832.58333	-2.577247915	-3.539236305	1834.291	-0.04	-4.81	
-4.752					1983.668	4.07E-06	1916.17	9.4	26.32	-0.69			1832.41667	-2.552921542	-3.73514897	1834.125	-0.13	-4.77	
-5.016					1983.649	4.57E-06	1916.09	9.37	26.68	-0.71			1832.25	-2.508908329	-3.889391786	1833.958	-0.44	-4.46	
-5.027					1983.63	4.6E-06	1916	9.37	26.71	-0.72			1832.08333	-2.481340549	-3.980284256	1833.791	-0.69	-4.26	
-4.862					1983.612	4.15E-06	1915.92	9.49	25.3	-0.74			1831.91667	-2.488794387	-3.936268037	1833.625	-0.55	-3.99	
-4.798					1983.593	4.15E-06	1915.84	9.55	24.55	-0.76			1831.75	-2.497392527	-3.80190324	1833.458	-0.4	-4.26	
-4.736					1983.574	4.49E-06	1915.75	9.65	23.34	-0.78			1831.58333	-2.839624908	-3.799413226	1833.291	-0.35	-4.8	
-4.814					1983.555	4.65E-06	1915.67	9.75	22.09	-0.79			1831.41667	-2.963750412	-3.963916691	1833.125	-0.56	-4.87	
-4.693					1983.532	4.85E-06	1915.59	9.75	22.14	-0.81			1831.25	-2.89667826	-3.857616731	1832.958	-0.75	-4.44	
-4.607					1983.508	4.96E-06	1915.5	9.63	23.5	-0.83			1831.08333	-2.563644149	-4.052833055	1832.791	-0.46	-4.28	
-4.506					1983.485	4.82E-06	1915.42	9.46	25.58	-0.85			1830.91667	-2.664258892	-3.727896904	1832.625	-0.66	-4.02	
-4.4					1983.462	5.54E-06	1915.34	9.38	26.57	-0.87			1830.75	-2.616814925	-3.57515286	1832.458	-0.86	-4.15	
-4.5					1983.439	6.33E-06	1915.25	9.31	27.43	-0.88			1830.58333	-2.953183079	-3.987512719	1832.291	-0.65	-4.54	
-4.718					1983.415	7.14E-06	1915.17	9.35	26.95	-0.9			1830.41667	-2.713769035	-4.096627273	1832.125	-0.54	-4.84	
-4.815					1983.392	7.55E-06	1915.09	9.41	26.21	-0.92			1830.25	-2.628426468	-4.172002534	1831.958	-0.54	-4.79	
-4.85					1983.369	0.000006	1915	9.42	26.1	-0.94			1830.08333	-2.40425139	-3.980981109	1831.791	-0.48	-4.38	
-4.829					1983.346	5.56E-06	1914.92	9.47	25.47	-0.96			1829.91667	-2.129315973	-3.783773098	1831.625	-0.35	-3.88	
-4.818					1983.322	4.92E-06	1914.84	9.57	24.23	-0.98			1829.75	-2.65073855	-3.484649263	1831.458	-0.91	-3.96	
-4.681					1983.299	4.66E-06	1914.75	9.64	23.42	-1			1829.58333	-3.339330436	-3.921994273	1831.291	-0.38	-4.34	
-4.565					1983.276	4.58E-06	1914.67	9.7	22.7	-1.02			1829.41667	-2.764384212	-3.861821611	1831.125	-0.54	-4.91	
-4.601					1983.253	4.38E-06	1914.59	9.65	23.34	-1.04			1829.25	-2.309471981	-4.024345234	1830.958	-0.36	-4.61	
-4.58					1983.229	4.25E-06	1914.5	9.52	24.92	-1.06			1829.08333	-2.145668407	-3.921509087	1830.791	-0.57	-4.49	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1830.583	-3.75						1899.3	0.07	-5.66							1912.63
						1830.417	-3.44						1899.2	0.05	-5.68							1912.54
						1830.25	-3.09						1899.11	0.09	-5.92							1912.46
						1830.083	-2.94						1899.02	0.15	-5.97							1912.38
						1829.917	-3.05						1898.93	0.11	-6.34							1912.29
						1829.75	-3.39						1898.75	-0.31	-6.5							1912.21
						1829.583	-3.84						1898.67	-0.45	-6.29							1912.13
						1829.417	-3.18						1898.58	-0.46	-6.57							1912.04
						1829.25	-2.94						1898.5	0.04	-6.43							1911.96
						1829.083	-2.93						1898.42	-0.33	-6.26							1911.88
						1828.917	-3.25						1898.33	0.12	-5.94							1911.79
						1828.75	-3.83						1898.25	0.23	-5.66							1911.71
						1828.583	-3.8						1898.17	0.32	-5.55							1911.63
						1828.417	-3.33						1898.08	-0.18	-5.65							1911.54
						1828.25	-2.98						1898	-0.17	-5.85							1911.46
						1828.083	-3.05						1897.92	-0.6	-6.36							1911.38
						1827.917	-3.53						1897.75	-0.75	-6.61							1911.29
						1827.75	-3.77						1897.68	-0.97	-6.43							1911.21
						1827.583	-3.59						1897.62	-1.08	-6.47							1911.13
						1827.417	-3.25						1897.55	-0.63	-6.34							1911.04
						1827.25	-2.82						1897.48	-0.34	-6.18							1910.96
						1827.083	-2.94						1897.42	-0.32	-6.12							1910.88
						1826.917	-3.54						1897.35	0.13	-5.94							1910.79
						1826.75	-3.5						1897.28	0.32	-5.89							1910.71
						1826.583	-3.27						1897.22	0.27	-5.65							1910.63
						1826.417	-3.04						1897.15	0.27	-5.54							1910.54
						1826.25	-2.81						1897.08	0.03	-5.77							1910.46
						1826.083	-2.74						1897.02	-0.33	-6.09							1910.38
						1825.917	-3.16						1896.95	-0.42	-5.93							1910.29
						1825.75	-3.44						1896.88	-0.42	-6.07							1910.21
						1825.583	-3.45						1896.75	-0.57	-6.31							1910.13
						1825.417	-3.48						1896.67	-0.22	-5.98							1910.04
						1825.25	-3.28						1896.6	-0.45	-5.95							1909.96
						1825.083	-2.78						1896.52	-0.47	-6.25							1909.88
						1824.917	-3.05						1896.44	-0.15	-6.18							1909.79
						1824.75	-3.3						1896.37	0.48	-5.77							1909.71
						1824.583	-3.47						1896.29	0.61	-5.48							1909.63
						1824.417	-3.56						1896.21	0.39	-5.32							1909.54
						1824.25	-3.25						1896.13	0.26	-5.41							1909.46
						1824.083	-2.85						1896.06	-0.05	-5.56							1909.38
						1823.917	-2.95						1895.98	-0.26	-5.9							1909.29
						1823.75	-3.25						1895.9	-0.65	-6.19							1909.21
						1823.583	-3.53						1895.75	-0.58	-6.24							1909.13
						1823.417	-3.37						1895.67	-0.61	-6.14							1909.04
						1823.25	-2.87						1895.6	-0.38	-6.18							1908.96

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.502					1983.206	4.11E-06	1914.42	9.43	25.94	-1.08			1828.91667	-2.485326703	-3.833664353	1830.625	-0.83	-3.87	
-4.454					1983.183	4.11E-06	1914.34	9.4	26.36	-1.1			1828.75	-2.51071754	-3.531588556	1830.458	-0.48	-4.33	
-4.772					1983.16	4.16E-06	1914.25	9.4	26.29	-1.12			1828.58333	-2.649404895	-3.623336188	1830.291	-0.61	-4.93	
-4.957					1983.136	4.23E-06	1914.17	9.44	25.81	-1.14			1828.41667	-2.401906789	-4.160967176	1830.125	-0.61	-5.16	
-4.987					1983.113	4.13E-06	1914.09	9.45	25.7	-1.15			1828.25	-2.372691811	-4.02151121	1829.958	-0.5	-4.25	
-4.973					1983.09	4.49E-06	1914	9.45	25.78	-1.17			1828.08333	-2.096025721	-3.81897705	1829.791	-0.44	-3.84	
-4.851					1983.067	4.4E-06	1913.92	9.49	25.26	-1.19			1827.91667	-2.176667194	-3.710662028	1829.625	-0.7	-3.85	
-4.778					1983.043	4.61E-06	1913.84	9.6	23.85	-1.21			1827.75	-2.737830753	-3.536221976	1829.458	-0.51	-4.32	
-4.741					1983.02	4.46E-06	1913.75	9.69	22.84	-1.23			1827.58333	-2.907279034	-3.587109237	1829.291	-0.16	-4.55	
-4.642					1982.997	4.25E-06	1913.67	9.66	23.18	-1.25			1827.41667	-2.659208607	-3.668750818	1829.125	-0.48	-4.87	
-4.581					1982.974	4.04E-06	1913.59	9.64	23.38	-1.26			1827.25	-2.203956102	-3.78206401	1828.958	-0.6	-4.44	
-4.568					1982.95	3.96E-06	1913.5	9.62	23.68	-1.28			1827.08333	-2.384803597	-3.964216542	1828.791	-0.27	-4.17	
-4.48					1982.927	3.8E-06	1913.42	9.5	25.13	-1.29			1826.91667	-2.004574744	-3.719978899	1828.625	-0.79	-3.91	
-4.315					1982.904	3.8E-06	1913.34	9.47	25.52	-1.31			1826.75	-1.852879182	-3.285138724	1828.458	-0.61	-4.29	
-4.353					1982.881	3.84E-06	1913.25	9.49	25.23	-1.32			1826.58333	-2.631714991	-3.715137074	1828.291	-0.46	-4.75	
-4.566					1982.857	3.93E-06	1913.17	9.52	24.91	-1.33			1826.41667	-2.403524706	-4.11725613	1828.125	-0.48	-4.84	
-4.645					1982.834	4.04E-06	1913.09	9.56	24.37	-1.34			1826.25	-1.847722994	-4.171666308	1827.958	-0.46	-4.64	
-4.653					1982.811	4.41E-06	1913	9.62	23.69	-1.35			1826.08333	-1.64412711	-3.902559783	1827.791	-0.25	-4.37	
-4.666					1982.788	4.35E-06	1912.92	9.66	23.24	-1.36			1825.91667	-1.522208144	-3.630328056	1827.625	-0.35	-4	
-4.698					1982.764	4.33E-06	1912.84	9.65	23.32	-1.37			1825.75	-2.492385195	-3.393179934	1827.458	-0.4	-4.07	
-4.672					1982.741	4.16E-06	1912.75	9.7	22.7	-1.37			1825.58333	-2.740155584	-3.525722756	1827.291	-0.32	-4.58	
-4.587					1982.718	4.18E-06	1912.67	9.69	22.82	-1.38			1825.41667	-2.290499032	-3.893243311	1827.125	-0.27	-4.97	
-4.555					1982.695	3.95E-06	1912.59	9.71	22.57	-1.38			1825.25	-2.256715563	-4.133268102	1826.958	-0.32	-4.88	
-4.431					1982.671	4.05E-06	1912.5	9.63	23.52	-1.39			1825.08333	-2.233861244	-4.216087153	1826.791	-0.43	-4.36	
-4.35					1982.648	3.88E-06	1912.42	9.52	24.88	-1.39			1824.91667	-2.145207172	-3.980882113	1826.625	-0.61	-3.99	
-4.336					1982.625	3.9E-06	1912.34	9.46	25.61	-1.39			1824.75	-2.116010275	-3.452032549	1826.458	-0.48	-4.22	
-4.378					1982.602	4.29E-06	1912.25	9.43	25.99	-1.39			1824.58333	-2.516639186	-3.664481493	1826.291	-0.46	-4.86	
-4.451					1982.578	4.56E-06	1912.17	9.44	25.85	-1.39			1824.41667	-2.644570677	-4.212444621	1826.125	-0.34	-4.75	
-4.716					1982.555	4.75E-06	1912.09	9.48	25.35	-1.38			1824.25	-2.312219948	-4.552298259	1825.958	-0.42	-4.62	
-4.718					1982.535	4.81E-06	1912	9.55	24.56	-1.38			1824.08333	-1.80423023	-4.436462775	1825.791	-0.47	-4.33	
-4.697					1982.515	4.34E-06	1911.92	9.61	23.79	-1.38			1823.91667	-2.049345453	-4.157171516	1825.625	-0.81	-4.18	
-4.631					1982.495	4.34E-06	1911.84	9.65	23.28	-1.38			1823.75	-2.492558007	-3.437936146	1825.458	-0.38	-4.56	
-4.604					1982.475	4.31E-06	1911.75	9.67	23.06	-1.37			1823.58333	-2.866081914	-3.64919606	1825.291	-0.22	-4.75	
-4.654					1982.455	4.52E-06	1911.67	9.67	23.06	-1.37			1823.41667	-2.847767182	-3.671468794	1825.125	-0.25	-4.81	
-4.468					1982.435	4.38E-06	1911.59	9.64	23.48	-1.36			1823.25	-2.173640728	-3.72507586	1824.958	-0.35	-4.61	
-4.439					1982.415	4.41E-06	1911.5	9.64	23.46	-1.36			1823.08333	-2.101349569	-4.007916033	1824.791	-0.44	-4.19	
-4.374					1982.395	4.27E-06	1911.42	9.57	24.27	-1.35			1822.91667	-1.871225464	-4.209473699	1824.625	-0.54	-3.91	
-4.264					1982.375	4.64E-06	1911.34	9.45	25.73	-1.34			1822.75	-2.393887884	-3.289491658	1824.458	-0.23	-4.56	
-4.39					1982.355	4.31E-06	1911.25	9.4	26.32	-1.34			1822.58333	-2.56731593	-3.287318936	1824.291	-0.02	-5.06	
-4.563					1982.335	4.14E-06	1911.17	9.4	26.29	-1.33			1822.41667	-2.621619811	-3.565690856	1824.125	0.02	-5.15	
-4.81					1982.315	4.29E-06	1911.09	9.39	26.43	-1.32			1822.25	-2.608118682	-3.718557797	1823.958	-0.01	-4.83	
-4.953					1982.295	4.15E-06	1911	9.44	25.88	-1.32			1822.08333	-2.27067317	-3.674895137	1823.791	0.01	-4.27	
-4.854					1982.275	4.23E-06	1910.92	9.51	25.06	-1.31			1821.91667	-2.174189066	-3.526706434	1823.625	0.09	-3.83	
-4.758					1982.255	4.09E-06	1910.84	9.58	24.1	-1.31			1821.75	-2.701565683	-3.363946335	1823.458	-0.28	-4.39	
-4.72					1982.235	4.09E-06	1910.75	9.64	23.42	-1.3			1821.58333	-2.607334343	-3.355370932	1823.291	-0.41	-3.93	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1823.083	-2.88						1895.52	-0.01	-6.11							1908.88
						1822.917	-3.24						1895.44	0.21	-6							1908.79
						1822.75	-3.49						1895.37	0.35	-5.76							1908.71
						1822.583	-3.54						1895.29	0.04	-5.51							1908.63
						1822.417	-3.56						1895.21	-0.18	-5.61							1908.54
						1822.25	-3.06						1895.13	-0.08	-5.59							1908.46
						1822.083	-2.79						1895.06	0.03	-5.84							1908.38
						1821.917	-3.05						1894.98	-0.19	-6.21							1908.29
						1821.75	-3.37						1894.9	-0.54	-6.35							1908.21
						1821.583	-3.66						1894.75	-0.99	-6.66							1908.13
						1821.417	-3.49						1894.68	-1.51	-6.77							1908.04
						1821.25	-2.88						1894.61	-0.98	-6.46							1907.96
						1821.083	-2.78						1894.54	-0.9	-6.42							1907.88
						1820.917	-3.12						1894.46	-0.67	-6.08							1907.79
						1820.75	-3.47						1894.39	-0.35	-5.85							1907.71
						1820.583	-3.66						1894.32	-0.2	-5.67							1907.63
						1820.417	-3.47						1894.25	0.02	-5.56							1907.54
						1820.25	-3.33						1894.18	0.34	-5.6							1907.46
						1820.083	-2.91						1894.11	0.35	-5.72							1907.38
						1819.917	-3.15						1894.04	-0.08	-5.9							1907.29
						1819.75	-3.4						1893.96	-0.66	-5.88							1907.21
						1819.583	-3.68						1893.89	-0.75	-5.79							1907.13
						1819.417	-3.77						1893.75	-0.71	-6.15							1907.04
						1819.25	-3.3						1893.65	-0.38	-6.12							1906.96
						1819.083	-2.77						1893.55	0.26	-5.61							1906.88
						1818.917	-2.93						1893.45	-0.03	-5.37							1906.79
						1818.75	-3.19						1893.35	0.28	-5.26							1906.71
						1818.583	-3.47						1893.25	0.02	-5.57							1906.63
						1818.417	-3.52						1893.15	-0.14	-5.78							1906.54
						1818.25	-2.93						1893.05	0.14	-5.77							1906.46
						1818.083	-2.93						1892.95	-0.56	-5.89							1906.38
						1817.917	-3.44						1892.75	-0.47	-6.08							1906.29
						1817.75	-3.54						1892.66	-0.47	-6.09							1906.21
						1817.583	-3.44						1892.57	-0.31	-5.92							1906.13
						1817.417	-3.29						1892.48	-0.05	-5.68							1906.04
						1817.25	-2.78						1892.39	0.56	-5.56							1905.96
						1817.083	-2.61						1892.3	0.5	-5.73							1905.88
						1816.917	-3.07						1892.2	-0.24	-5.97							1905.79
						1816.75	-3.39						1892.11	-0.37	-6.24							1905.71
						1816.583	-3.68						1892.02	0.05	-6.31							1905.63
						1816.417	-3.52						1891.93	-0.2	-6.28							1905.54
						1816.25	-3.17						1891.75	-0.75	-6.55							1905.46
						1816.083	-3.01						1891.66	-0.24	-6.34							1905.38
						1815.917	-3.13						1891.57	0.1	-5.86							1905.29
						1815.75	-3.37						1891.48	0.02	-5.7							1905.21

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.611					1982.215	4.29E-06	1910.67	9.67	23.06	-1.3			1821.41667	-2.597584813	-3.67068633	1823.125	-0.14	-4.53	
-4.508					1982.195	4.7E-06	1910.59	9.61	23.8	-1.29			1821.25	-2.025522157	-4.000614419	1822.958	-0.15	-4.97	
-4.532					1982.175	4.84E-06	1910.5	9.58	24.2	-1.29			1821.08333	-1.889997407	-3.839110333	1822.791	-0.23	-4.26	
-4.445					1982.155	4.45E-06	1910.42	9.52	24.85	-1.28			1820.91667	-2.704893811	-3.705996089	1822.625	-0.78	-3.97	
-4.383					1982.135	4.59E-06	1910.34	9.46	25.63	-1.28			1820.75	-2.913485987	-3.440906418	1822.458	-0.67	-4.24	
-4.391					1982.115	4.52E-06	1910.25	9.43	25.98	-1.28			1820.58333	-2.457534843	-3.619988789	1822.291	-0.48	-4.59	
-4.518					1982.095	4.42E-06	1910.17	9.42	26.11	-1.27			1820.41667	-1.704947588	-3.903368516	1822.125	-0.22	-5.01	
-4.731					1982.075	4.17E-06	1910.09	9.42	26.13	-1.27			1820.25	-1.941815701	-3.940108094	1821.958	-0.3	-4.76	
-4.848					1982.055	4.01E-06	1910	9.47	25.52	-1.27			1820.08333	-2.247518416	-3.872609141	1821.791	-0.38	-4.42	
-4.698					1982.035	3.95E-06	1909.92	9.51	25.02	-1.27			1819.91667	-2.380665639	-3.619202965	1821.625	-0.47	-3.98	
-4.601					1982.015	3.93E-06	1909.84	9.57	24.3	-1.26			1819.75	-2.141971199	-3.407829271	1821.458	-0.6	-4.11	
-4.616					1981.995	4.07E-06	1909.75	9.63	23.55	-1.26			1819.58333	-2.723842945	-3.657214579	1821.291	-0.45	-4.5	
-4.6					1981.975	4.26E-06	1909.67	9.65	23.3	-1.26			1819.41667	-2.665027068	-3.961195908	1821.125	-0.35	-4.81	
-4.569					1981.955	4.3E-06	1909.59	9.64	23.43	-1.26			1819.25	-2.068522158	-3.804405187	1820.958	-0.31	-4.74	
-4.427					1981.935	4.13E-06	1909.5	9.62	23.63	-1.26			1819.08333	-1.465117835	-3.824015765	1820.791	-0.26	-4.33	
-4.275					1981.915	3.93E-06	1909.42	9.54	24.58	-1.26			1818.91667	-1.981734822	-3.979890045	1820.625	-0.38	-4.05	
-4.276					1981.895	3.89E-06	1909.34	9.49	25.2	-1.26			1818.75	-2.070671324	-3.577319441	1820.458	-0.4	-4.35	
-4.601					1981.875	3.99E-06	1909.25	9.45	25.78	-1.26			1818.58333	-2.926313863	-3.470363542	1820.291	-0.45	-4.81	
-4.605					1981.855	4.14E-06	1909.17	9.41	26.25	-1.26			1818.41667	-2.7885012	-3.569458741	1820.125	-0.53	-5.04	
-4.838					1981.835	4.17E-06	1909.09	9.45	25.71	-1.26			1818.25	-2.467361257	-3.645771313	1819.958	-0.55	-4.9	
-4.886					1981.815	4.41E-06	1909	9.49	25.28	-1.26			1818.08333	-1.97357035	-3.742509211	1819.791	-0.51	-4.48	
-4.779					1981.795	4.39E-06	1908.92	9.49	25.21	-1.26			1817.91667	-2.17363912	-3.990714454	1819.625	-0.64	-4	
-4.708					1981.775	4.47E-06	1908.84	9.55	24.53	-1.26			1817.75	-2.319368797	-3.711706479	1819.458	-0.44	-4.23	
-4.666					1981.755	4.65E-06	1908.75	9.6	23.89	-1.26			1817.58333	-2.789393287	-3.733435148	1819.291	-0.2	-4.48	
-4.601					1981.735	4.84E-06	1908.67	9.62	23.67	-1.26			1817.41667	-2.827788111	-3.909390187	1819.125	-0.1	-4.7	
-4.555					1981.715	4.88E-06	1908.59	9.66	23.13	-1.26			1817.25	-2.562119013	-4.037451005	1818.958	-0.15	-4.63	
-4.473					1981.695	4.96E-06	1908.5	9.63	23.53	-1.25			1817.08333	-2.366165568	-3.788433131	1818.791	-0.28	-4.22	
-4.381					1981.675	4.72E-06	1908.42	9.59	24.03	-1.25			1816.91667	-2.543902866	-3.730816857	1818.625	-0.33	-4.04	
-4.346					1981.655	4.74E-06	1908.34	9.51	24.98	-1.25			1816.75	-2.681786183	-3.65236324	1818.458	-0.53	-4.37	
-4.601					1981.635	4.56E-06	1908.25	9.43	25.98	-1.25			1816.58333	-3.009415138	-3.665378947	1818.291	-0.41	-4.65	
-5.039					1981.615	4.58E-06	1908.17	9.44	25.81	-1.24			1816.41667	-2.333596019	-3.795622343	1818.125	0.03	-4.89	
-5.15					1981.595	4.44E-06	1908.09	9.49	25.3	-1.24			1816.25	-2.203888611	-3.735424509	1817.958	-0.21	-4.68	
-5.062					1981.575	4.56E-06	1908	9.55	24.54	-1.24			1816.08333	-2.072540161	-3.587666658	1817.791	-0.4	-4.38	
-4.862					1981.555	4.51E-06	1907.92	9.59	24.09	-1.23			1815.91667	-2.515872194	-3.569928089	1817.625	-0.56	-3.99	
-4.807					1981.538	4.45E-06	1907.84	9.58	24.2	-1.23			1815.75	-2.959204228	-3.552189519	1817.458	-0.38	-4.16	
-4.762					1981.522	4.47E-06	1907.75	9.62	23.72	-1.22			1815.58333	-2.626412366	-3.715451445	1817.291	-0.39	-4.5	
-4.766					1981.505	4.81E-06	1907.67	9.69	22.82	-1.21			1815.41667	-2.322627921	-3.946780504	1817.125	-0.38	-4.8	
-4.697					1981.488	5.17E-06	1907.59	9.71	22.57	-1.21			1815.25	-2.303912601	-4.069696252	1816.958	-0.34	-4.8	
-4.667					1981.472	5.03E-06	1907.5	9.67	23.11	-1.2			1815.08333	-2.11356417	-3.793735201	1816.791	-0.29	-4.4	
-4.681					1981.455	4.84E-06	1907.42	9.65	23.35	-1.19			1814.91667	-1.705193688	-3.540307012	1816.625	-0.21	-3.74	
-4.575					1981.438	4.69E-06	1907.34	9.6	23.86	-1.18			1814.75	-2.544449613	-3.456079582	1816.458	-0.37	-4.31	
-4.915					1981.422	4.56E-06	1907.25	9.48	25.33	-1.17			1814.58333	-2.931667966	-3.818692646	1816.291	-0.17	-4.68	
-4.901					1981.405	4.46E-06	1907.17	9.47	25.52	-1.16			1814.41667	-2.884500604	-3.889251511	1816.125	-0.26	-4.78	
-4.867					1981.388	4.48E-06	1907.09	9.43	26.01	-1.14			1814.25	-2.66411657	-3.938338413	1815.958	-0.39	-4.6	
-4.853					1981.372	4.65E-06	1907	9.42	26.1	-1.13			1814.08333	-2.373425296	-3.923436273	1815.791	-0.22	-4.26	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1815.583	-3.43						1891.39	0.02	-5.74							1905.13
						1815.417	-3.39						1891.3	0.11	-5.89							1905.04
						1815.25	-2.96						1891.2	-0.15	-6.03							1904.96
						1815.083	-2.96						1891.11	-0.43	-6.14							1904.88
						1814.917	-3.36						1891.02	-0.5	-6.35							1904.79
						1814.75	-3.58						1890.93	-0.49	-6.32							1904.71
						1814.583	-3.92						1890.75	-0.68	-6.34							1904.63
						1814.417	-3.33						1890.67	-0.43	-6.36							1904.54
						1814.25	-3.16						1890.58	-0.57	-6.43							1904.46
						1814.083	-3.1						1890.5	-0.18	-6.14							1904.38
						1813.917	-3.32						1890.42	-0.02	-5.84							1904.29
						1813.75	-3.58						1890.33	0.18	-5.65							1904.21
						1813.583	-3.45						1890.25	0.12	-5.66							1904.13
						1813.417	-3.37						1890.17	-0.2	-5.8							1904.04
						1813.25	-2.97						1890.08	-0.49	-5.87							1903.96
						1813.083	-2.79						1890	-0.86	-6.02							1903.88
						1812.917	-3.26						1889.92	-0.84	-6.21							1903.79
						1812.75	-3.67						1889.75	-0.93	-6.3							1903.71
						1812.583	-3.92						1889.67	-0.96	-6.24							1903.63
						1812.417	-3.37						1889.58	-0.4	-5.98							1903.54
						1812.25	-3.12						1889.5	-0.23	-6.02							1903.46
						1812.083	-2.93						1889.42	-0.21	-6							1903.38
						1811.917	-3.27						1889.33	-0.03	-5.83							1903.29
						1811.75	-3.62						1889.25	-0.21	-5.75							1903.21
						1811.583	-3.79						1889.17	-0.37	-5.59							1903.13
						1811.417	-3.42						1889.08	-0.07	-5.57							1903.04
						1811.25	-3.27						1889	-0.03	-5.9							1902.96
						1811.083	-3.04						1888.92	-0.45	-6.22							1902.88
						1810.917	-3.17						1888.75	-0.67	-6.27							1902.79
						1810.75	-3.53						1888.67	-0.42	-6.23							1902.71
						1810.583	-3.67						1888.6	0.17	-6.03							1902.63
						1810.417	-3.45						1888.52	-0.07	-5.97							1902.54
						1810.25	-3.28						1888.44	-0.15	-6.06							1902.46
						1810.083	-3						1888.37	0.04	-5.82							1902.38
						1809.917	-3.39						1888.29	0.04	-5.53							1902.29
						1809.75	-3.56						1888.21	-0.09	-5.49							1902.21
						1809.583	-3.31						1888.13	-0.2	-5.72							1902.13
						1809.417	-3.19						1888.06	-0.29	-5.71							1902.04
						1809.25	-3.13						1887.98	-0.71	-6.03							1901.96
						1809.083	-3.16						1887.9	-0.9	-6.21							1901.88
						1808.917	-3.45						1887.75	-0.77	-6.33							1901.79
						1808.75	-3.78						1887.68	-0.55	-6.19							1901.71
						1808.583	-3.67						1887.61	-0.38	-6.06							1901.63
						1808.417	-3.57						1887.54	-0.14	-5.96							1901.54
						1808.25	-3.19						1887.46	-0.29	-5.86							1901.46

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.836					1981.355	4.76E-06	1906.92	9.49	25.28	-1.12			1813.91667	-2.234249585	-3.777421348	1815.625	-0.31	-4.09	
-4.775					1981.338	5.14E-06	1906.84	9.54	24.59	-1.11			1813.75	-2.185282375	-3.590999448	1815.458	-0.26	-4.42	
-4.728					1981.322	5.43E-06	1906.75	9.56	24.4	-1.1			1813.58333	-2.729852013	-3.582400499	1815.291	-0.28	-4.79	
-4.727					1981.305	5.33E-06	1906.67	9.58	24.15	-1.08			1813.41667	-2.912402039	-3.700042961	1815.125	-0.31	-4.95	
-4.702					1981.288	5.66E-06	1906.59	9.56	24.4	-1.07			1813.25	-2.666220239	-3.796160013	1814.958	-0.38	-4.68	
-4.67					1981.272	5.92E-06	1906.5	9.55	24.55	-1.06			1813.08333	-2.362542775	-4.047323634	1814.791	-0.48	-4.11	
-4.666					1981.255	5.86E-06	1906.42	9.5	25.09	-1.04			1812.91667	-2.434409802	-4.012689226	1814.625	-0.38	-3.9	
-4.528					1981.238	5.61E-06	1906.34	9.43	25.95	-1.03			1812.75	-2.09212375	-3.484529611	1814.458	-0.33	-4.39	
-4.781					1981.222	5.96E-06	1906.25	9.39	26.46	-1.02			1812.58333	-2.649150204	-3.374809345	1814.291	-0.29	-4.64	
-4.876					1981.205	6.34E-06	1906.17	9.42	26.04	-1			1812.41667	-2.928051624	-3.67315065	1814.125	-0.25	-4.74	
-4.875					1981.188	6.49E-06	1906.09	9.46	25.64	-0.99			1812.25	-3.06074927	-3.870387453	1813.958	-0.31	-4.62	
-4.832					1981.172	6.5E-06	1906	9.54	24.69	-0.97			1812.08333	-2.478039092	-3.920229796	1813.791	-0.43	-4.26	
-4.863					1981.155	6.54E-06	1905.92	9.57	24.22	-0.96			1811.91667	-2.014815018	-3.717374406	1813.625	-0.19	-3.8	
-4.717					1981.138	6.66E-06	1905.84	9.56	24.34	-0.95			1811.75	-2.485239133	-3.487755409	1813.458	-0.26	-4.5	
-4.597					1981.122	6.93E-06	1905.75	9.6	23.95	-0.93			1811.58333	-2.871340566	-3.521421804	1813.291	-0.3	-4.93	
-4.564					1981.105	0.000007	1905.67	9.64	23.42	-0.92			1811.41667	-3.09713532	-3.888586965	1813.125	-0.37	-4.96	
-4.568					1981.088	9.35E-06	1905.59	9.6	23.86	-0.9			1811.25	-2.665477927	-3.825541984	1812.958	-0.4	-4.6	
-4.538					1981.072	1.53E-05	1905.5	9.54	24.64	-0.89			1811.08333	-2.63793081	-3.701887688	1812.791	-0.4	-4.07	
-4.472					1981.055	1.37E-05	1905.42	9.46	25.61	-0.88			1810.91667	-2.630294887	-3.654033889	1812.625	-0.58	-3.98	
-4.558					1981.038	1.23E-05	1905.34	9.35	26.95	-0.86			1810.75	-2.8631	-3.596921282	1812.458	-0.44	-4.61	
-4.652					1981.022	1.03E-05	1905.25	9.37	26.74	-0.85			1810.58333	-2.832530405	-3.879403101	1812.291	-0.38	-4.99	
-4.828					1981.005	8.26E-06	1905.17	9.37	26.73	-0.83			1810.41667	-1.958490856	-4.215695915	1812.125	-0.54	-4.96	
-4.92					1980.988	5.14E-06	1905.09	9.43	25.97	-0.82			1810.25	-2.03786655	-4.145163741	1811.958	-0.68	-4.62	
-4.916					1980.972	4.27E-06	1905	9.51	24.94	-0.81			1810.08333	-2.309791586	-3.936659051	1811.791	-0.61	-4.25	
-4.923					1980.955	4.14E-06	1904.92	9.56	24.38	-0.79			1809.91667	-2.511803682	-3.656640723	1811.625	-0.52	-4.16	
-4.827					1980.938	4.22E-06	1904.84	9.61	23.75	-0.78			1809.75	-2.787303804	-3.457157941	1811.458	-0.72	-4.58	
-4.75					1980.922	4.38E-06	1904.75	9.69	22.81	-0.76			1809.58333	-2.780362029	-3.597550616	1811.291	-0.61	-5	
-4.755					1980.905	4.06E-06	1904.67	9.7	22.7	-0.75			1809.41667	-2.720363545	-4.227867107	1811.125	-0.65	-5.04	
-4.758					1980.888	4.09E-06	1904.59	9.63	23.56	-0.73			1809.25	-2.294788811	-3.990574634	1810.958	-0.67	-4.72	
-4.62					1980.872	4.06E-06	1904.5	9.59	24.03	-0.72			1809.08333	-1.873820266	-3.872028908	1810.791	-0.47	-4.3	
-4.558					1980.855	4.15E-06	1904.42	9.47	25.49	-0.7			1808.91667	-2.110282249	-3.834720079	1810.625	-0.44	-3.96	9.11894
-4.588					1980.838	4.11E-06	1904.34	9.38	26.55	-0.69			1808.75	-2.867945356	-3.404253815	1810.458	-0.36	-4.64	9.02469
-4.588					1980.822	4.03E-06	1904.25	9.37	26.65	-0.67			1808.58333	-2.895475053	-3.459691636	1810.291	-0.43	-4.89	8.93956
-4.703					1980.805	3.83E-06	1904.17	9.33	27.16	-0.66			1808.41667	-2.908635638	-3.604346026	1810.125	-0.4	-4.98	8.86354
-4.773					1980.788	3.83E-06	1904.09	9.38	26.57	-0.64			1808.25	-2.104790711	-3.903927746	1809.958	-0.22	-4.86	9.05866
-4.728					1980.772	3.83E-06	1904	9.44	25.88	-0.63			1808.08333	-1.821444991	-3.866215417	1809.791	-0.07	-4.5	9.21068
-4.713					1980.755	3.84E-06	1903.92	9.57	24.22	-0.61			1807.91667	-1.821764023	-3.574326077	1809.625	-0.41	-4.23	9.31961
-4.782					1980.738	3.8E-06	1903.84	9.6	23.96	-0.6			1807.75	-2.26034164	-3.482161638	1809.458	-0.45	-4.57	9.29177
-4.719					1980.722	3.9E-06	1903.75	9.63	23.59	-0.59			1807.58333	-2.570076521	-3.770815255	1809.291	-0.42	-5.23	9.1172
-4.687					1980.705	3.95E-06	1903.67	9.57	24.27	-0.57			1807.41667	-2.232487765	-3.684766383	1809.125	-0.25	-5.05	9.03434
-4.601					1980.688	3.94E-06	1903.59	9.49	25.24	-0.56			1807.25	-2.276368534	-3.87598511	1808.958	-0.36	-4.66	9.1117
-4.441					1980.672	3.97E-06	1903.5	9.5	25.17	-0.55			1807.08333	-2.417521913	-3.63503028	1808.791	-0.48	-4.44	9.09899
-4.235					1980.655	3.97E-06	1903.42	9.44	25.88	-0.53			1806.91667	-2.147940027	-3.472290868	1808.625	-0.58	-4.24	9.25342
-4.339					1980.638	3.98E-06	1903.34	9.36	26.81	-0.52			1806.75	-2.613140163	-3.330230961	1808.458	-0.23	-4.69	9.04288
-4.546					1980.622	4.03E-06	1903.25	9.35	26.93	-0.51			1806.58333	-2.53984286	-3.528995109	1808.291	0.15	-4.81	8.92733

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1808.083	-2.93						1887.39	-0.22	-5.55							1901.38
						1807.917	-3						1887.32	0.1	-5.73							1901.29
						1807.75	-3.4						1887.25	-0.1	-5.56							1901.21
						1807.583	-3.71						1887.18	0.45	-5.4							1901.13
						1807.417	-3.56						1887.11	0.6	-5.23							1901.04
						1807.25	-3.21						1887.04	0.47	-5.42							1900.96
						1807.083	-2.96						1886.96	0.38	-5.54							1900.88
						1806.917	-3.02						1886.89	0.59	-5.65							1900.79
						1806.75	-3.33						1886.75	0.11	-5.94							1900.71
						1806.583	-3.6						1886.68	-0.02	-5.92							1900.63
						1806.417	-3.47						1886.61	0.52	-5.77							1900.54
						1806.25	-3.03						1886.46	0.39	-5.52							1900.46
						1806.083	-2.74						1886.32	0.51	-5.04							1900.38
						1805.917	-3.22						1886.25	0.91	-5.24							1900.29
						1805.75	-3.65						1886.18	0.92	-5.29							1900.21
						1805.583	-3.75						1886.11	0.35	-5.59							1900.13
						1805.417	-3.4						1886.04	0.1	-5.91							1900.04
						1805.25	-3.31						1885.96	-0.64	-6.1							1899.96
						1805.083	-3.34						1885.89	-0.61	-6.2							1899.88
						1804.917	-3.48						1885.75	-0.19	-6.24							1899.79
						1804.75	-3.71						1885.64	0.21	-6.13							1899.71
						1804.583	-3.86						1885.53	0.77	-5.68							1899.63
						1804.417	-3.6						1885.42	0.83	-5.57							1899.54
						1804.25	-3.38						1885.31	0.88	-5.59							1899.46
						1804.083	-3.25						1885.19	1.04	-5.41							1899.38
						1803.917	-3.43						1885.08	0.56	-5.53							1899.29
						1803.75	-3.76						1884.97	0.12	-6.04							1899.21
						1803.583	-3.71						1884.75	0.01	-6.02							1899.13
						1803.417	-3.48						1884.66	0.39	-5.84							1899.04
						1803.25	-3.05						1884.57	1.08	-5.86							1898.96
						1803.083	-3.11						1884.48	1.05	-5.65							1898.88
						1802.917	-3.39						1884.39	1.01	-5.5							1898.79
						1802.75	-3.65						1884.3	0.6	-5.42							1898.71
						1802.583	-3.67						1884.2	0.54	-5.37							1898.63
						1802.417	-3.57						1884.11	0.34	-5.47							1898.54
						1802.25	-3.24						1884.02	0.05	-5.79							1898.46
						1802.083	-2.97						1883.93	-0.55	-6.07							1898.38
						1801.917	-3.05						1883.75	-1	-6.19							1898.29
						1801.75	-3.2						1883.67	-0.67	-6.15							1898.21
						1801.583	-3.56						1883.6	0.67	-5.51							1898.13
						1801.417	-3.85						1883.52	0.27	-5.85							1898.04
						1801.25	-3.29						1883.44	0.63	-5.81							1897.96
						1801.083	-3.17						1883.37	0.75	-5.47							1897.88
						1800.917	-3.22						1883.29	0.93	-5.21							1897.79
						1800.75	-3.48						1883.21	1.11	-5.18							1897.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.725					1980.605	4.24E-06	1903.17	9.37	26.7	-0.5			1806.41667	-2.317502308	-3.587848204	1808.125	-0.06	-4.72	8.92639
-4.916					1980.588	4.37E-06	1903.09	9.38	26.61	-0.49			1806.25	-2.244941534	-3.964331792	1807.958	-0.45	-4.44	9.05518
-4.929					1980.572	4.05E-06	1903	9.41	26.17	-0.48			1806.08333	-1.873525212	-4.119350189	1807.791	-0.52	-4.1	9.16709
-4.954					1980.555	4.1E-06	1902.92	9.48	25.33	-0.47			1805.91667	-1.956829991	-4.128510545	1807.625	-0.58	-3.98	9.2621
-4.885					1980.536	4.07E-06	1902.84	9.54	24.63	-0.46			1805.75	-1.967470725	-3.733863693	1807.458	-0.53	-4.54	9.12428
-4.823					1980.518	4.16E-06	1902.75	9.6	23.9	-0.45			1805.58333	-2.833307203	-3.558293637	1807.291	-0.31	-4.85	9.04589
-4.762					1980.499	4.32E-06	1902.67	9.61	23.79	-0.44			1805.41667	-2.757545176	-3.808022315	1807.125	-0.39	-4.82	8.91537
-4.68					1980.481	4.45E-06	1902.59	9.57	24.32	-0.44			1805.25	-2.34485873	-3.686197635	1806.958	-0.64	-4.53	8.98958
-4.663					1980.462	4.39E-06	1902.5	9.48	25.42	-0.43			1805.08333	-1.999685712	-3.84503173	1806.791	-0.75	-4.18	9.10558
-4.57					1980.444	4.48E-06	1902.42	9.38	26.54	-0.42			1804.91667	-1.970187613	-3.904243394	1806.625	-0.73	-4.02	9.26337
-4.553					1980.425	4.71E-06	1902.34	9.35	26.97	-0.41			1804.75	-2.197852673	-3.51593056	1806.458	-0.48	-4.65	9.1732
-4.658					1980.407	4.44E-06	1902.25	9.36	26.83	-0.41			1804.58333	-2.250601013	-3.449129841	1806.291	-0.63	-4.97	8.93717
-4.757					1980.388	4.4E-06	1902.17	9.39	26.51	-0.4			1804.41667	-2.513349184	-4.040298386	1806.125	-0.65	-4.93	8.89878
-4.739					1980.37	4.3E-06	1902.09	9.44	25.86	-0.4			1804.25	-2.221965219	-3.87850768	1805.958	-0.57	-4.66	9.01508
-4.822					1980.351	4.39E-06	1902	9.49	25.3	-0.39			1804.08333	-2.344529119	-4.135424109	1805.791	-0.56	-4.32	9.11586
-4.795					1980.333	4.45E-06	1901.92	9.53	24.78	-0.38			1803.91667	-2.47459964	-3.880805157	1805.625	-0.55	-3.96	9.20111
-4.768					1980.314	4.46E-06	1901.84	9.56	24.34	-0.38			1803.75	-2.394817801	-3.437577692	1805.458	-0.69	-4.51	9.16436
-4.836					1980.296	4.69E-06	1901.75	9.58	24.11	-0.37			1803.58333	-2.664738059	-3.572193538	1805.291	-0.74	-4.83	9.06682
-4.649					1980.277	4.68E-06	1901.67	9.59	24.03	-0.37			1803.41667	-2.676635391	-3.868816477	1805.125	-0.51	-4.81	8.90849
-4.602					1980.259	4.88E-06	1901.59	9.57	24.29	-0.36			1803.25	-2.446402936	-4.12120549	1804.958	-0.3	-4.51	8.9265
-4.559					1980.24	5.24E-06	1901.5	9.53	24.72	-0.36			1803.08333	-2.735362748	-3.827205462	1804.791	-0.35	-4.18	9.05329
-4.473					1980.222	5.38E-06	1901.42	9.45	25.73	-0.35			1802.91667	-2.392660116	-3.363637298	1804.625	-0.41	-4.06	9.22562
-4.421					1980.203	5.5E-06	1901.34	9.39	26.43	-0.35			1802.75	-2.447068264	-3.270468483	1804.458	-0.55	-4.58	9.16587
-4.595					1980.185	5.03E-06	1901.25	9.42	26.06	-0.34			1802.58333	-2.81755426	-3.775111886	1804.291	-0.19	-4.83	8.99357
-4.82					1980.166	4.51E-06	1901.17	9.44	25.89	-0.34			1802.41667	-2.678861147	-3.976844834	1804.125	-0.24	-4.84	8.94755
-4.807					1980.148	4.42E-06	1901.09	9.39	26.47	-0.33			1802.25	-2.433602923	-3.785195712	1803.958	-0.45	-4.66	9.05116
-4.677					1980.129	4.99E-06	1901	9.37	26.7	-0.33			1802.08333	-2.827459276	-3.706881017	1803.791	-0.38	-4.37	9.14203
-4.774					1980.111	4.62E-06	1900.92	9.41	26.25	-0.33			1801.91667	-2.585313508	-3.618280189	1803.625	-0.44	-4.06	9.21612
-4.656					1980.092	4.38E-06	1900.84	9.43	25.99	-0.32			1801.75	-2.189280718	-3.45553612	1803.458	-0.55	-4.32	9.12972
-4.635					1980.074	4.33E-06	1900.75	9.51	24.96	-0.32			1801.58333	-2.467334433	-3.565428397	1803.291	-0.37	-4.66	9.0231
-4.601					1980.055	4.11E-06	1900.67	9.58	24.15	-0.32			1801.41667	-2.571864992	-3.774290406	1803.125	-0.31	-4.71	8.89626
-4.523					1980.036	3.98E-06	1900.59	9.6	23.87	-0.32			1801.25	-2.421820867	-3.757061513	1802.958	-0.37	-4.52	9.09892
-4.464					1980.018	3.75E-06	1900.5	9.54	24.59	-0.31			1801.08333	-2.27911408	-3.520538594	1802.791	-0.43	-4.23	9.16218
-4.439					1979.999	3.69E-06	1900.42	9.5	25.13	-0.31			1800.91667	-2.791538843	-3.32941006	1802.625	-0.46	-3.83	9.25024
-4.371					1979.981	3.65E-06	1900.34	9.43	26.02	-0.31			1800.75	-2.585286602	-3.304037754	1802.458	-0.59	-4.35	9.05257
-4.365					1979.962	3.74E-06	1900.25	9.32	27.26	-0.31			1800.58333	-2.568002778	-3.470259564	1802.291	-0.03	-4.98	8.99
-4.608					1979.944	4.1E-06	1900.17	9.4	26.35	-0.31			1800.41667	-2.449369747	-3.736919859	1802.125	-0.56	-4.96	8.94144
-4.937					1979.925	4.08E-06	1900.09	9.46	25.57	-0.3			1800.25	-2.356951291	-3.83126987	1801.958	-0.37	-4.5	9.0278
-4.992					1979.907	4.04E-06	1900	9.48	25.42	-0.3			1800.08333	-2.432000074	-3.85319063	1801.791	-0.35	-4.07	9.12398
-4.899					1979.888	3.88E-06	1899.92	9.49	25.27	-0.3			1799.91667	-2.529387723	-3.947502192	1801.625	-0.58	-4.05	9.22999
-4.849					1979.87	3.8E-06	1899.84	9.48	25.31	-0.3			1799.75	-2.660070635	-3.319291104	1801.458	-0.05	-4.59	9.02309
-4.769					1979.851	3.78E-06	1899.75	9.51	24.99	-0.3			1799.58333	-2.631720602	-3.520391202	1801.291	-0.18	-5.01	8.99428
-4.774					1979.833	4.07E-06	1899.67	9.53	24.76	-0.3			1799.41667	-3.235970621	-3.59486949	1801.125	-0.41	-5.02	8.84321
-4.778					1979.814	4.55E-06	1899.59	9.52	24.93	-0.3			1799.25	-2.860501215	-3.650559282	1800.958	-0.6	-4.66	8.96297
-4.598					1979.796	4.55E-06	1899.5	9.48	25.31	-0.3			1799.08333	-1.916779387	-3.86755809	1800.791	-0.78	-4.22	9.09535

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1800.583	-3.75						1883.13	0.62	-5.25							1897.63
						1800.417	-3.62						1883.06	0.59	-5.6							1897.54
						1800.25	-3.25						1882.98	0.38	-6.03							1897.46
						1800.083	-3.08						1882.9	-0.11	-6.09							1897.38
						1799.917	-3.25						1882.75	0.27	-6.1							1897.29
						1799.75	-3.41						1882.65	0.12	-5.97							1897.21
						1799.583	-3.57						1882.55	0.17	-5.71							1897.13
						1799.417	-3.71						1882.45	0.64	-5.49							1897.04
						1799.25	-3.7						1882.35	0.28	-5.5							1896.96
						1799.083	-3.01						1882.25	0.25	-5.56							1896.88
						1798.917	-3.35						1882.15	0.17	-5.63							1896.79
						1798.75	-3.85						1882.05	0	-5.9							1896.71
						1798.583	-3.96						1881.95	-0.21	-6.2							1896.63
						1798.417	-3.8						1881.75	-0.53	-6.37							1896.54
						1798.25	-3.44						1881.67	-0.43	-6.33							1896.46
						1798.083	-2.88						1881.58	-0.7	-6.1							1896.38
						1797.917	-3.39						1881.5	-0.73	-6.18							1896.29
						1797.75	-3.61						1881.42	0.03	-6.23							1896.21
						1797.583	-3.62						1881.33	0.65	-5.81							1896.13
						1797.417	-3.51						1881.25	0.01	-5.52							1896.04
						1797.25	-3						1881.17	0.12	-5.37							1895.96
						1797.083	-2.94						1881.08	0.23	-5.58							1895.88
						1796.917	-3.49						1881	-0.24	-5.99							1895.79
						1796.75	-3.59						1880.92	-0.48	-6.38							1895.71
						1796.583	-3.83						1880.75	-0.7	-6.63							1895.63
						1796.417	-3.56						1880.67	-0.6	-6.25							1895.54
						1796.25	-3.22						1880.6	-0.68	-6.41							1895.46
						1796.083	-2.97						1880.52	-0.3	-6.28							1895.38
						1795.917	-3.49						1880.44	0.1	-6.08							1895.29
						1795.75	-3.52						1880.37	-0.44	-6.29							1895.21
						1795.583	-3.79						1880.29	-0.54	-6.15							1895.13
						1795.417	-3.49						1880.21	-0.18	-6.03							1895.04
						1795.25	-2.97						1880.13	0.27	-5.79							1894.96
						1795.083	-3.02						1880.06	0.09	-5.75							1894.88
						1794.917	-3.48						1879.98	0.02	-5.85							1894.79
						1794.75	-3.58						1879.9	-0.27	-6.24							1894.71
						1794.583	-3.81						1879.75	-0.19	-6.42							1894.63
						1794.417	-3.47						1879.68	-0.4	-6.36							1894.54
						1794.25	-2.89						1879.61	-0.76	-6.25							1894.46
						1794.083	-2.91						1879.54	-0.26	-6.21							1894.38
						1793.917	-3.29						1879.46	0.19	-6.1							1894.29
						1793.75	-3.41						1879.39	-0.28	-6.4							1894.21
						1793.583	-3.76						1879.32	-0.11	-6.29							1894.13
						1793.417	-3.43						1879.25	0.1	-6.07							1894.04
						1793.25	-3.09						1879.18	0.11	-5.83							1893.96

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.578					1979.777	4.37E-06	1899.42	9.44	25.89	-0.31			1798.91667	-2.768092943	-3.759086564	1800.625	-0.87	-4.14	9.24034
-4.584					1979.759	4.41E-06	1899.34	9.38	26.57	-0.31			1798.75	-2.299674737	-3.365544491	1800.458	-0.57	-4.48	9.09728
-4.635					1979.74	4.41E-06	1899.25	9.32	27.29	-0.31			1798.58333	-2.239771465	-3.592212722	1800.291	-0.41	-4.84	9.01646
-4.696					1979.722	4.41E-06	1899.17	9.28	27.76	-0.31			1798.41667	-2.14767293	-3.639941671	1800.125	-0.39	-4.89	8.95691
-4.887					1979.703	4.7E-06	1899.09	9.32	27.35	-0.32			1798.25	-2.687404492	-3.897983207	1799.958	-0.49	-4.69	9.01466
-4.941					1979.685	4.94E-06	1899	9.38	26.53	-0.32			1798.08333	-2.965317527	-4.146992342	1799.791	-0.64	-4.39	9.15116
-4.934					1979.666	4.77E-06	1898.92	9.45	25.73	-0.32			1797.91667	-2.495720224	-4.034923248	1799.625	-0.52	-3.96	9.26243
-4.879					1979.648	4.65E-06	1898.84	9.5	25.11	-0.33			1797.75	-3.239855779	-3.880546129	1799.458	-0.67	-4.19	9.02741
-4.882					1979.629	4.45E-06	1898.75	9.6	23.91	-0.33			1797.58333	-3.212880901	-3.907375063	1799.291	-0.39	-4.74	8.92588
-4.692					1979.611	4.54E-06	1898.67	9.62	23.67	-0.34			1797.41667	-2.926120154	-3.995252025	1799.125	-0.22	-5.01	8.91304
-4.698					1979.592	4.5E-06	1898.59	9.55	24.53	-0.34			1797.25	-2.51979619	-4.025561317	1798.958	-0.32	-4.85	9.02414
-4.711					1979.574	4.51E-06	1898.5	9.51	24.99	-0.35			1797.08333	-1.84228407	-3.71115314	1798.791	-0.53	-4.46	9.13468
-4.643					1979.555	4.48E-06	1898.42	9.42	26.13	-0.35			1796.91667	-2.122167255	-3.490670307	1798.625	-0.39	-4.18	9.24465
-4.557					1979.533	4.7E-06	1898.34	9.36	26.87	-0.36			1796.75	-2.546432147	-3.367713113	1798.458	-0.44	-4.33	9.06437
-4.595					1979.511	4.76E-06	1898.25	9.31	27.42	-0.36			1796.58333	-2.801087909	-3.644901357	1798.291	-0.24	-4.9	8.93844
-4.742					1979.488	4.67E-06	1898.17	9.39	26.46	-0.37			1796.41667	-2.641992006	-4.103398792	1798.125	-0.45	-5.07	8.91912
-4.854					1979.466	4.68E-06	1898.09	9.38	26.57	-0.37			1796.25	-2.226504284	-4.19503071	1797.958	-0.69	-4.93	9.01263
-4.909					1979.444	4.49E-06	1898	9.45	25.74	-0.37			1796.08333	-1.85288852	-3.814159367	1797.791	-0.55	-4.34	9.11787
-4.908					1979.422	4.42E-06	1897.92	9.51	25	-0.38			1795.91667	-1.750870634	-3.266042986	1797.625	-0.46	-4.07	9.24136
-4.762					1979.399	4.49E-06	1897.84	9.58	24.1	-0.38			1795.75	-2.310424383	-3.320707885	1797.458	-0.58	-4.36	9.09239
-4.714					1979.377	4.55E-06	1897.75	9.6	23.87	-0.38			1795.58333	-2.923461554	-3.80951293	1797.291	-0.5	-4.82	9.02727
-4.653					1979.355	4.66E-06	1897.67	9.6	23.91	-0.38			1795.41667	-2.986938117	-4.129915431	1797.125	-0.41	-4.94	8.928
-4.571					1979.333	4.56E-06	1897.59	9.56	24.44	-0.39			1795.25	-2.59116429	-4.143012673	1796.958	-0.62	-4.58	9.04607
-4.51					1979.311	4.75E-06	1897.5	9.51	24.97	-0.39			1795.08333	-2.607779708	-3.792849005	1796.791	-0.61	-4.16	9.19244
-4.403					1979.288	4.88E-06	1897.42	9.48	25.39	-0.38			1794.91667	-2.563765606	-3.91104813	1796.625	-0.55	-4.03	9.20148
-4.296					1979.266	5.71E-06	1897.34	9.47	25.48	-0.38			1794.75	-2.404018557	-3.621078034	1796.458	-0.25	-4.56	9.12872
-4.415					1979.244	6.03E-06	1897.25	9.46	25.57	-0.38						1796.291	-0.16	-4.8	9.04954
-4.534					1979.222	6.77E-06	1897.17	9.45	25.68	-0.38						1796.125	-0.29	-4.75	8.96394
-4.648					1979.199	7.4E-06	1897.09	9.5	25.18	-0.37						1795.958	-0.33	-4.53	9.00432
-4.772					1979.177	7.27E-06	1897	9.51	25	-0.37						1795.791	-0.36	-4.29	9.18539
-4.847					1979.155	6.38E-06	1896.92	9.55	24.55	-0.36						1795.625	-0.4	-4.02	9.28704
-4.831					1979.133	6.22E-06	1896.84	9.61	23.8	-0.35						1795.458	-0.87	-4.11	9.20172
-4.773					1979.111	5.56E-06	1896.75	9.63	23.55	-0.35						1795.291	-0.48	-4.68	9.05323
-4.701					1979.088	5.19E-06	1896.67	9.62	23.67	-0.34						1795.125	-0.18	-4.93	8.95626
-4.663					1979.066	4.41E-06	1896.59	9.57	24.32	-0.33						1794.958	-0.6	-4.81	8.96929
-4.542					1979.044	4.26E-06	1896.5	9.48	25.35	-0.32						1794.791	-0.65	-4.53	9.15026
-4.452					1979.022	4.2E-06	1896.42	9.4	26.34	-0.31						1794.625	-0.59	-4.16	9.18323
-4.315					1978.999	3.97E-06	1896.34	9.38	26.55	-0.3						1794.458	-0.77	-4.37	9.05783
-4.426					1978.977	3.85E-06	1896.25	9.34	27.02	-0.29						1794.291	-0.21	-4.78	8.97653
-4.592					1978.955	4.03E-06	1896.17	9.35	26.95	-0.28						1794.125	-0.48	-4.79	8.94746
-4.723					1978.933	4.32E-06	1896.09	9.38	26.58	-0.27						1793.958	-0.46	-4.57	9.00695
-4.721					1978.911	4.17E-06	1896	9.41	26.23	-0.26						1793.791	-0.51	-4.35	9.16499
-4.748					1978.888	4.31E-06	1895.92	9.52	24.86	-0.25						1793.625	-0.61	-4.09	9.19746
-4.712					1978.866	4.26E-06	1895.84	9.56	24.4	-0.24						1793.458	-0.7	-4.35	9.01077
-4.638					1978.844	4.36E-06	1895.75	9.56	24.36	-0.23						1793.291	-0.43	-4.93	8.8159

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1793.083	-2.8						1879.11	0.17	-5.74							1893.88
						1792.917	-3.22						1879.04	0.31	-5.69							1893.79
						1792.75	-3.62						1878.96	0.48	-5.96							1893.71
						1792.583	-4.01						1878.89	0.36	-6.16							1893.63
						1792.417	-3.82						1878.75	0.22	-6.37							1893.54
						1792.25	-3.26						1878.67	0.08	-6.29							1893.46
						1792.083	-2.88						1878.58	0.16	-6.15							1893.38
						1791.917	-3.06						1878.5	-0.01	-6.13							1893.29
						1791.75	-3.5						1878.42	-0.6	-6.04							1893.21
						1791.583	-3.54						1878.33	-0.63	-5.73							1893.13
						1791.417	-3.46						1878.25	-0.74	-5.67							1893.04
						1791.25	-3.19						1878.17	-0.55	-5.59							1892.96
						1791.083	-2.62						1878.08	-0.3	-5.44							1892.88
						1790.917	-3.06						1878	-0.27	-5.45							1892.79
						1790.75	-3.4						1877.92	-0.33	-6.11							1892.71
						1790.583	-3.56						1877.75	-0.73	-6.44							1892.63
						1790.417	-3.65						1877.66	-0.82	-6.14							1892.54
						1790.25	-3.35						1877.57	-0.64	-6.13							1892.46
						1790.083	-2.76						1877.48	-0.36	-6.08							1892.38
						1789.917	-3.01						1877.39	-0.81	-5.99							1892.29
						1789.75	-3.51						1877.3	-1.05	-5.7							1892.21
						1789.583	-3.78						1877.2	-0.56	-5.55							1892.13
						1789.417	-3.59						1877.11	-0.28	-5.69							1892.04
						1789.25	-3.09						1877.02	-0.12	-5.92							1891.96
						1789.083	-2.77						1876.93	-0.06	-6.15							1891.88
						1788.917	-3.15						1876.75	-0.71	-6.25							1891.79
						1788.75	-3.47						1876.65	-0.83	-6.21							1891.71
						1788.583	-3.52						1876.55	-0.34	-6.07							1891.63
						1788.417	-3.34						1876.45	-0.39	-5.74							1891.54
						1788.25	-3.21						1876.35	-0.09	-5.57							1891.46
						1788.083	-3.05						1876.25	-0.26	-5.57							1891.38
						1787.917	-3.3						1876.15	-0.46	-5.58							1891.29
						1787.75	-3.37						1876.05	-0.84	-5.86							1891.21
						1787.583	-3.65						1875.95	-0.8	-6.12							1891.13
						1787.417	-3.64						1875.75	-1.02	-6.32							1891.04
						1787.25	-3.21						1875.65	-0.99	-6.12							1890.96
						1787.083	-3.06						1875.55	-0.49	-6.08							1890.88
						1786.917	-3.39						1875.45	-0.25	-6.08							1890.79
						1786.75	-3.74						1875.35	-0.62	-5.83							1890.71
						1786.583	-3.75						1875.25	0.13	-5.55							1890.63
						1786.417	-3.43						1875.15	0.32	-5.49							1890.54
						1786.25	-3.34						1875.05	0.72	-5.56							1890.46
						1786.083	-3.02						1874.95	0.41	-6.06							1890.38
						1785.917	-3.15						1874.75	-0.26	-6.15							1890.29
						1785.75	-3.41						1874.65	0.14	-6.06							1890.21

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.621					1978.822	4.41E-06	1895.67	9.52	24.88	-0.22						1793.125	-0.65	-5.01	8.78517
-4.561					1978.799	4.49E-06	1895.59	9.46	25.56	-0.21						1792.958	-0.65	-4.67	9.14638
-4.432					1978.777	4.51E-06	1895.5	9.43	26.01	-0.21						1792.791	-0.57	-4.12	9.21539
-4.417					1978.755	4.11E-06	1895.42	9.4	26.32	-0.2						1792.625	-0.63	-4.01	9.23665
-4.316					1978.733	4.25E-06	1895.34	9.37	26.74	-0.19						1792.458	-0.47	-4.45	9.07588
-4.439					1978.711	4.04E-06	1895.25	9.34	27.05	-0.19						1792.291	-0.38	-4.77	8.97052
-4.62					1978.688	4.23E-06	1895.17	9.35	26.95	-0.19						1792.125	-0.48	-4.91	8.92059
-4.834					1978.666	4.23E-06	1895.09	9.37	26.68	-0.18						1791.958	-0.59	-4.79	8.99167
-4.837					1978.644	4.47E-06	1895	9.39	26.49	-0.18						1791.791	-0.55	-4.46	9.13137
-4.858					1978.622	0.000005	1894.92	9.46	25.61	-0.18						1791.625	-0.68	-4.15	9.25313
-4.833					1978.599	5.48E-06	1894.84	9.5	25.16	-0.18						1791.458	-1	-4.2	9.178
-4.802					1978.577	5.1E-06	1894.75	9.52	24.88	-0.18						1791.291	-0.67	-4.66	9.00577
-4.741					1978.555	4.45E-06	1894.67	9.58	24.15	-0.18						1791.125	-0.55	-4.93	8.87787
-4.619					1978.535	4.31E-06	1894.59	9.52	24.92	-0.19						1790.958	-0.64	-4.78	9.03302
-4.467					1978.516	4.19E-06	1894.5	9.44	25.83	-0.19						1790.791	-0.72	-4.4	9.16858
-4.428					1978.496	4.41E-06	1894.42	9.35	26.92	-0.2						1790.625	-0.52	-4.05	9.32406
-4.328					1978.477	4.44E-06	1894.34	9.29	27.73	-0.2						1790.458	-0.88	-4.25	9.16576
-4.429					1978.457	4.33E-06	1894.25	9.25	28.12	-0.21						1790.291	-0.96	-4.68	9.01571
-4.726					1978.437	4.39E-06	1894.17	9.28	27.76	-0.22						1790.125	-0.7	-4.89	8.94137
-4.848					1978.418	4.49E-06	1894.09	9.33	27.18	-0.23						1789.958	-0.64	-4.67	8.96988
-4.919					1978.398	4.65E-06	1894	9.34	27.07	-0.25						1789.791	-0.69	-4.38	9.12728
-4.998					1978.379	4.93E-06	1893.92	9.36	26.81	-0.26						1789.625	-0.67	-4.03	9.20124
-4.815					1978.359	5.82E-06	1893.84	9.45	25.72	-0.27						1789.458	-0.44	-4.19	9.11432
-4.765					1978.339	4.93E-06	1893.75	9.53	24.81	-0.29						1789.291	-0.27	-4.59	8.97984
-4.735					1978.32	4.42E-06	1893.67	9.59	24.03	-0.3						1789.125	0.3	-5.02	8.94625
-4.679					1978.3	4.53E-06	1893.59	9.61	23.84	-0.32						1788.958	-0.36	-4.43	9.12953
-4.588					1978.28	4.39E-06	1893.5	9.59	24	-0.33						1788.791	-0.34	-4.14	9.23696
-4.385					1978.261	4.32E-06	1893.42	9.51	25	-0.35						1788.625	-0.55	-3.97	9.2521
-4.333					1978.241	4.15E-06	1893.34	9.44	25.82	-0.36						1788.458	-0.28	-4.15	9.15954
-4.519					1978.222	4.17E-06	1893.25	9.39	26.48	-0.38						1788.291	-0.08	-4.75	9.06538
-4.689					1978.202	4.15E-06	1893.17	9.4	26.37	-0.4						1788.125	-0.11	-4.83	8.96962
-4.815					1978.182	4.55E-06	1893.09	9.4	26.31	-0.41						1787.958	-0.3	-4.49	9.07372
-4.827					1978.163	5.08E-06	1893	9.45	25.76	-0.43						1787.791	-0.41	-4.19	9.19187
-4.833					1978.143	5.49E-06	1892.92	9.49	25.3	-0.44						1787.625	-0.18	-3.91	9.27546
-4.833					1978.124	5.35E-06	1892.84	9.51	24.95	-0.46						1787.458	-0.36	-4.17	9.09941
-4.713					1978.104	4.81E-06	1892.75	9.55	24.52	-0.47						1787.291	-0.1	-4.72	8.97242
-4.548					1978.084	4.6E-06	1892.67	9.65	23.3	-0.49						1787.125	-0.05	-4.95	8.90986
-4.537					1978.065	4.18E-06	1892.59	9.62	23.67	-0.5						1786.958	-0.3	-4.49	9.07765
-4.348					1978.045	4.31E-06	1892.5	9.54	24.66	-0.51						1786.791	-0.45	-4	9.1872
-4.272					1978.026	4.2E-06	1892.42	9.45	25.76	-0.52						1786.625	-0.63	-3.95	9.23852
-4.188					1978.006	4.12E-06	1892.34	9.4	26.33	-0.53						1786.458	-0.59	-4.34	9.1909
-4.27					1977.986	4.09E-06	1892.25	9.42	26.11	-0.54						1786.291	-0.46	-4.98	9.06364
-4.633					1977.967	4.15E-06	1892.17	9.38	26.58	-0.55						1786.125	-0.02	-4.98	8.88422
-4.932					1977.947	4.04E-06	1892.09	9.43	25.93	-0.56						1785.958	-0.43	-4.45	8.91615
-4.909					1977.928	4.36E-06	1892	9.55	24.58	-0.56						1785.791	-0.32	-4.08	9.08954

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1785.583	-3.86						1874.55	0.4	-5.85							1890.13
						1785.417	-3.45						1874.45	0.08	-5.68							1890.04
						1785.25	-3.26						1874.35	0.44	-5.35							1889.96
						1785.083	-3.03						1874.25	0.72	-5.31							1889.88
						1784.917	-3.31						1874.15	0.98	-5.53							1889.79
						1784.75	-3.55						1874.05	0.75	-5.99							1889.71
						1784.583	-3.65						1873.95	-0.27	-6.3							1889.63
						1784.417	-3.34						1873.75	0.66	-6.35							1889.54
						1784.25	-3.16						1873.63	0.15	-6.29							1889.46
						1784.083	-2.91						1873.5	0.37	-6.09							1889.38
						1783.917	-3.25						1873.38	0	-5.65							1889.29
						1783.75	-3.54						1873.25	0.27	-5.5							1889.21
						1783.583	-3.58						1873.13	0.1	-5.58							1889.13
						1783.417	-3.02						1873	0.37	-5.89							1889.04
						1783.25	-2.94						1872.75	0.29	-6.31							1888.96
						1783.083	-2.74						1872.66	-0.16	-6.01							1888.88
						1782.917	-2.9						1872.57	0.56	-6.07							1888.79
						1782.75	-3.27						1872.48	0.73	-6.01							1888.71
						1782.583	-3.7						1872.39	0.38	-5.64							1888.63
						1782.417	-3.37						1872.3	0.19	-5.55							1888.54
						1782.25	-3.19						1872.2	0.3	-5.66							1888.46
						1782.083	-2.91						1872.11	0.19	-5.67							1888.38
						1781.917	-3.04						1872.02	0.55	-5.81							1888.29
						1781.75	-3.3						1871.93	0.27	-5.91							1888.21
						1781.583	-3.5						1871.75	-0.17	-5.92							1888.13
						1781.417	-3.5						1871.63	-0.21	-5.91							1888.04
						1781.25	-2.85						1871.5	0.09	-5.67							1887.96
						1781.083	-2.98						1871.38	0.13	-5.64							1887.88
						1780.917	-3.68						1871.25	-0.21	-5.47							1887.79
						1780.75	-3.55						1871.13	1.1	-5.42							1887.71
						1780.583	-3.67						1871	0.99	-5.83							1887.63
						1780.417	-3.55						1870.75	0.62	-5.86							1887.54
						1780.25	-3.19						1870.66	0.69	-5.83							1887.46
						1780.083	-2.84						1870.57	0.09	-5.65							1887.38
						1779.917	-3.04						1870.48	0.34	-5.45							1887.29
						1779.75	-3.37						1870.39	0.37	-5.48							1887.21
						1779.583	-3.53						1870.3	0.35	-5.55							1887.13
						1779.417	-3.38						1870.2	0.53	-5.55							1887.04
						1779.25	-3.1						1870.11	0.82	-5.78							1886.96
						1779.083	-3.07						1870.02	0.41	-5.94							1886.88
						1778.917	-3.48						1869.93	0.19	-6.17							1886.79
						1778.75	-3.7						1869.75	0.15	-6.18							1886.71
						1778.583	-3.48						1869.66	0.32	-6.19							1886.63
						1778.417	-3.33						1869.57	0.65	-5.76							1886.54
						1778.25	-3.2						1869.48	0.83	-5.41							1886.46

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.798					1977.908	4.19E-06	1891.92	9.54	24.66	-0.57						1785.625	-0.45	-4.07	9.28632
-4.713					1977.888	4.14E-06	1891.84	9.59	23.99	-0.57						1785.458	-0.24	-4.34	9.18109
-4.692					1977.869	0.000004	1891.75	9.65	23.3	-0.57						1785.291	-0.2	-4.53	9.06263
-4.691					1977.849	3.89E-06	1891.67	9.68	22.94	-0.57						1785.125	-0.32	-4.64	8.93092
-4.721					1977.83	3.86E-06	1891.59	9.69	22.86	-0.57						1784.958	-0.39	-4.37	8.94364
-4.705					1977.81	3.94E-06	1891.5	9.59	23.99	-0.57						1784.791	-0.49	-4.13	9.05703
-4.608					1977.79	3.92E-06	1891.42	9.52	24.91	-0.57						1784.625	-0.62	-3.94	9.27109
-4.4					1977.771	4.2E-06	1891.34	9.46	25.65	-0.56						1784.458	-0.43	-4.47	9.16192
-4.533					1977.751	4.69E-06	1891.25	9.4	26.34	-0.56						1784.291	-0.22	-4.92	9.02011
-4.753					1977.731	4.68E-06	1891.17	9.4	26.34	-0.55						1784.125	-0.28	-4.91	8.92697
-4.886					1977.712	4.7E-06	1891.09	9.41	26.24	-0.54						1783.958	-0.5	-4.61	
-4.842					1977.692	4.92E-06	1891	9.46	25.59	-0.53						1783.791	-0.62	-4.36	
-4.723					1977.673	4.72E-06	1890.92	9.49	25.22	-0.53						1783.625	-0.56	-4.23	
-4.749					1977.653	4.52E-06	1890.84	9.52	24.91	-0.52						1783.458	-0.38	-4.39	
-4.755					1977.633	4.48E-06	1890.75	9.54	24.59	-0.51						1783.291	-0.19	-4.91	
-4.695					1977.614	4.38E-06	1890.67	9.57	24.27	-0.5						1783.125	-0.08	-5.08	
-4.607					1977.594	4.84E-06	1890.59	9.55	24.53	-0.48						1782.958	-0.17	-4.89	
-4.582					1977.575	4.96E-06	1890.5	9.52	24.9	-0.47						1782.791	-0.4	-4.56	
-4.371					1977.555	4.99E-06	1890.42	9.48	25.35	-0.46						1782.625	-0.34	-4.12	
-4.401					1977.536	5.26E-06	1890.34	9.45	25.77	-0.45						1782.458	-0.54	-4.33	
-4.643					1977.517	5.41E-06	1890.25	9.37	26.74	-0.43						1782.291	-0.14	-4.92	
-4.8					1977.498	5.67E-06	1890.17	9.32	27.31	-0.42						1782.125	0.33	-4.98	
-4.854					1977.48	5.59E-06	1890.09	9.34	27.03	-0.41						1781.958	-0.11	-4.46	
-4.795					1977.461	5.81E-06	1890	9.45	25.67	-0.4						1781.791	-0.43	-4.28	
-4.766					1977.442	5.49E-06	1889.92	9.47	25.44	-0.38						1781.625	-0.55	-4.01	
-4.689					1977.423	5.13E-06	1889.84	9.52	24.83	-0.37						1781.458	-0.32	-4.53	
-4.652					1977.404	5.3E-06	1889.75	9.57	24.31	-0.36						1781.291	-0.13	-4.84	
-4.566					1977.385	5.36E-06	1889.67	9.54	24.64	-0.35						1781.125	-0.26	-4.78	
-4.483					1977.366	5.34E-06	1889.59	9.54	24.66	-0.34						1780.958	-0.48	-4.5	
-4.535					1977.347	5.25E-06	1889.5	9.5	25.15	-0.33						1780.791	-0.51	-4.22	
-4.482					1977.329	5.47E-06	1889.42	9.47	25.52	-0.32						1780.625	-0.43	-3.87	
-4.441					1977.31	5.94E-06	1889.34	9.41	26.19	-0.31						1780.458	-0.39	-4.06	
-4.506					1977.291	7.02E-06	1889.25	9.34	27.03	-0.3						1780.291	-0.17	-4.39	
-4.674					1977.272	8.2E-06	1889.17	9.3	27.56	-0.29						1780.125	0.24	-4.86	
-4.679					1977.253	8.7E-06	1889.09	9.32	27.28	-0.28						1779.958	0.01	-4.68	
-4.645					1977.234	7.39E-06	1889	9.31	27.42	-0.27						1779.791	-0.12	-4.29	
-4.706					1977.215	6.95E-06	1888.92	9.39	26.44	-0.26						1779.625	-0.16	-3.69	
-4.715					1977.197	6.53E-06	1888.84	9.42	26.1	-0.26						1779.458	-0.46	-3.9	
-4.652					1977.178	6.06E-06	1888.75	9.51	24.96	-0.25						1779.291	-0.18	-4.48	
-4.601					1977.159	5.68E-06	1888.67	9.57	24.27	-0.25						1779.125	0.69	-5.43	
-4.554					1977.14	5.26E-06	1888.59	9.53	24.78	-0.24						1778.958	0.04	-4.8	
-4.533					1977.121	5.16E-06	1888.5	9.5	25.15	-0.24						1778.791	-0.35	-4.24	
-4.405					1977.102	4.87E-06	1888.42	9.47	25.49	-0.23						1778.625	-0.46	-3.76	
-4.34					1977.083	4.42E-06	1888.34	9.43	25.96	-0.23						1778.458	-0.36	-4.19	
-4.425					1977.064	4.25E-06	1888.25	9.41	26.26	-0.22						1778.291	-0.41	-4.83	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1778.083	-3.12						1869.39	0.99	-5.4							1886.38
						1777.917	-3.21						1869.3	0.75	-5.46							1886.29
						1777.75	-3.46						1869.2	0.67	-5.64							1886.21
						1777.583	-3.58						1869.11	0.56	-5.83							1886.13
						1777.417	-3.5						1869.02	0.12	-6.24							1886.04
						1777.25	-3.51						1868.93	0.33	-6.37							1885.96
						1777.083	-3.05						1868.75	0.18	-6.32							1885.88
						1776.917	-3.39						1868.66	-0.01	-6.33							1885.79
						1776.75	-3.37						1868.57	0.36	-6.2							1885.71
						1776.583	-3.51						1868.48	0.37	-6							1885.63
						1776.417	-3.32						1868.39	0.54	-5.75							1885.54
						1776.25	-2.98						1868.3	0.33	-5.66							1885.46
						1776.083	-2.89						1868.2	0.38	-5.59							1885.38
						1775.917	-3.17						1868.11	0.16	-5.85							1885.29
						1775.75	-3.44						1868.02	0.07	-6.13							1885.21
						1775.583	-3.78						1867.93	-0.25	-6.1							1885.13
						1775.417	-3.4						1867.75	-0.32	-6.14							1885.04
						1775.25	-3.04						1867.65	-0.25	-6.25							1884.96
						1775.083	-2.97						1867.55	0.28	-6.13							1884.88
						1774.917	-3.32						1867.45	0.6	-5.72							1884.79
						1774.75	-3.7						1867.35	0.8	-5.39							1884.71
						1774.583	-3.83						1867.25	0.67	-5.48							1884.63
						1774.417	-3.42						1867.15	0.47	-5.51							1884.54
						1774.25	-3.18						1867.05	0.01	-5.81							1884.46
						1774.083	-2.96						1866.95	-0.19	-6.32							1884.38
						1773.917	-3.25						1866.75	-0.1	-6.38							1884.29
						1773.75	-3.44						1866.67	-0.33	-6.19							1884.21
						1773.583	-3.63						1866.6	0.02	-5.92							1884.13
						1773.417	-3.4						1866.52	0.36	-5.77							1884.04
						1773.25	-2.97						1866.44	0.47	-5.75							1883.96
						1773.083	-2.9						1866.37	0.39	-5.44							1883.88
						1772.917	-3.06						1866.29	0.49	-5.47							1883.79
						1772.75	-3.36						1866.21	0.55	-5.57							1883.71
						1772.583	-3.64						1866.13	0.37	-5.84							1883.63
						1772.417	-3.47						1866.06	0.24	-6.04							1883.54
						1772.25	-3.32						1865.98	0.29	-6.12							1883.46
						1772.083	-2.9						1865.9	0.14	-6.15							1883.38
						1771.917	-3.06						1865.75	0.13	-6.22							1883.29
						1771.75	-3.26						1865.64	0.13	-5.98							1883.21
						1771.583	-3.57						1865.53	0.5	-5.7							1883.13
						1771.417	-3.67						1865.42	0.54	-5.49							1883.04
						1771.25	-3.24						1865.31	0.52	-5.52							1882.96
						1771.083	-3.13						1865.19	0.33	-5.89							1882.88
						1770.917	-3.29						1865.08	-0.08	-6.39							1882.79
						1770.75	-3.5						1864.97	-0.07	-6.32							1882.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.623					1977.046	4.24E-06	1888.17	9.38	26.61	-0.22						1778.125	-0.24	-5.05	
-4.855					1977.027	4.16E-06	1888.09	9.37	26.68	-0.22						1777.958	-0.08	-4.84	
-4.953					1977.008	4.05E-06	1888	9.42	26.07	-0.22						1777.791	-0.23	-4.44	
-4.93					1976.989	4.05E-06	1887.92	9.47	25.49	-0.21						1777.625	-0.5	-3.97	
-4.869					1976.97	4.02E-06	1887.84	9.55	24.46	-0.21						1777.458	-0.73	-4.15	
-4.924					1976.951	4.34E-06	1887.75	9.64	23.43	-0.21						1777.291	-0.44	-4.52	
-4.831					1976.932	4.21E-06	1887.67	9.63	23.55	-0.21						1777.125	-0.26	-4.73	
-4.701					1976.913	4.2E-06	1887.59	9.61	23.76	-0.2						1776.958	-0.32	-4.63	
-4.699					1976.895	4.21E-06	1887.5	9.6	23.91	-0.2						1776.791	-0.54	-4.29	
-4.64					1976.876	4.12E-06	1887.42	9.54	24.6	-0.2						1776.625	-0.86	-4.06	
-4.394					1976.857	4.08E-06	1887.34	9.49	25.27	-0.2						1776.458	-0.79	-4.55	
-4.464					1976.838	4.01E-06	1887.25	9.39	26.52	-0.2						1776.291	-0.54	-4.86	
-4.71					1976.819	4.02E-06	1887.17	9.32	27.26	-0.19						1776.125	-0.11	-4.99	
-4.858					1976.8	3.93E-06	1887.09	9.32	27.32	-0.19						1775.958	-0.32	-4.73	
-4.725					1976.781	4.53E-06	1887	9.34	27.09	-0.19						1775.791	-0.46	-4.38	
-4.765					1976.763	4.39E-06	1886.92	9.38	26.64	-0.19						1775.625	-0.55	-3.93	
-4.748					1976.744	4.94E-06	1886.84	9.41	26.23	-0.19						1775.458	-0.77	-4.19	
-4.757					1976.725	5.2E-06	1886.75	9.45	25.73	-0.19						1775.291	-0.54	-4.8	
-4.737					1976.706	5.39E-06	1886.67	9.53	24.76	-0.2						1775.125	-0.41	-4.96	
-4.583					1976.687	5.44E-06	1886.59	9.56	24.4	-0.2						1774.958	-0.36	-4.7	
-4.457					1976.668	5.48E-06	1886.5	9.54	24.59	-0.2						1774.791	-0.33	-4.35	
-4.407					1976.649	5.63E-06	1886.42	9.48	25.31	-0.21						1774.625	-0.73	-3.99	
-4.337					1976.63	5.58E-06	1886.34	9.43	25.99	-0.21						1774.458	-0.62	-4.51	
-4.384					1976.612	5.55E-06	1886.25	9.35	27.01	-0.21						1774.291	-0.35	-4.8	
-4.491					1976.593	5.62E-06	1886.17	9.34	27.03	-0.22						1774.125	-0.38	-4.89	
-4.6					1976.574	5.51E-06	1886.09	9.3	27.53	-0.23						1773.958	-0.48	-4.68	
-4.654					1976.555	5.5E-06	1886	9.3	27.61	-0.23						1773.791	-0.49	-4.27	
-4.533					1976.533	5.6E-06	1885.92	9.39	26.46	-0.24						1773.625	-0.89	-4.19	
-4.477					1976.51	5.72E-06	1885.84	9.42	26.15	-0.25						1773.458	-0.94	-4.38	
-4.466					1976.488	5.56E-06	1885.75	9.42	26.1	-0.26						1773.291	-0.72	-4.63	
-4.481					1976.466	5.7E-06	1885.67	9.53	24.76	-0.27						1773.125	-0.23	-4.96	
-4.472					1976.443	5.69E-06	1885.59	9.57	24.25	-0.28						1772.958	-0.28	-4.8	
-4.368					1976.421	5.58E-06	1885.5	9.46	25.62	-0.29						1772.791	-0.35	-4.41	
-4.258					1976.399	5.33E-06	1885.42	9.42	26.1	-0.3						1772.625	-0.43	-3.78	
-4.229					1976.376	5.43E-06	1885.34	9.36	26.85	-0.31						1772.458	-0.78	-3.89	
-4.287					1976.354	5.51E-06	1885.25	9.38	26.63	-0.33						1772.291	-0.42	-4.58	
-4.448					1976.332	5.93E-06	1885.17	9.39	26.52	-0.34						1772.125	-0.34	-4.85	
-4.711					1976.309	6.09E-06	1885.09	9.45	25.71	-0.35						1771.958	-0.53	-4.65	
-4.834					1976.287	6.2E-06	1885	9.5	25.17	-0.36						1771.791	-0.72	-4.37	
-4.746					1976.265	6.7E-06	1884.92	9.53	24.79	-0.37						1771.625	-0.99	-4.14	
-4.632					1976.242	6.28E-06	1884.84	9.6	23.85	-0.38						1771.458	-0.86	-4.72	
-4.573					1976.22	6.69E-06	1884.75	9.69	22.8	-0.39						1771.291	-0.61	-4.93	
-4.511					1976.198	6.81E-06	1884.67	9.71	22.57	-0.4						1771.125	-0.34	-4.97	
-4.523					1976.175	6.54E-06	1884.59	9.66	23.16	-0.4						1770.958	-0.26	-4.83	
-4.468					1976.153	6.45E-06	1884.5	9.62	23.68	-0.41						1770.791	-0.57	-4.48	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1770.583	-3.84						1864.75	-0.39	-6.39							1882.63
						1770.417	-3.44						1864.65	0.52	-6.17							1882.54
						1770.25	-3.16						1864.55	0.97	-5.76							1882.46
						1770.083	-3.15						1864.45	0.53	-5.48							1882.38
						1769.917	-3.41						1864.35	0.27	-5.47							1882.29
						1769.75	-3.47						1864.25	0.52	-5.41							1882.21
						1769.583	-3.57						1864.15	0.56	-5.56							1882.13
						1769.417	-3.1						1864.05	0.04	-5.82							1882.04
						1769.25	-3						1863.95	-0.4	-6.17							1881.96
						1769.083	-2.94						1863.75	-0.43	-6.39							1881.88
						1768.917	-3.34						1863.67	-0.45	-6.21							1881.79
						1768.75	-3.64						1863.6	-0.65	-6.21							1881.71
						1768.583	-3.47						1863.52	-0.29	-6.18							1881.63
						1768.417	-3.1						1863.44	0.19	-5.78							1881.54
						1768.25	-3.16						1863.37	0.22	-5.5							1881.46
						1768.083	-3.09						1863.29	0.04	-5.48							1881.38
						1767.917	-3.46						1863.21	-0.01	-5.69							1881.29
						1767.75	-3.63						1863.13	-0.1	-6.01							1881.21
						1767.583	-3.82						1863.06	0.12	-6.17							1881.13
						1767.417	-3.33						1862.98	-0.72	-6.69							1881.04
						1767.25	-3.1						1862.9	-0.47	-6.42							1880.96
						1767.083	-2.92						1862.75	-1.03	-6.65							1880.88
						1766.917	-3.14						1862.65	-0.54	-6.58							1880.79
						1766.75	-3.49						1862.55	-0.29	-6.53							1880.71
						1766.583	-3.55						1862.45	-0.11	-6.16							1880.63
						1766.417	-3.4						1862.35	0.1	-5.88							1880.54
						1766.25	-3.2						1862.25	0.48	-5.96							1880.46
						1766.083	-3.1						1862.15	0.4	-5.79							1880.38
						1765.917	-3.51						1862.05	0.32	-5.95							1880.29
						1765.75	-3.71						1861.95	0.23	-6.36							1880.21
						1765.583	-3.85						1861.75	-0.18	-6.56							1880.13
						1765.417	-3.63						1861.68	-0.04	-6.23							1880.04
						1765.25	-3.37						1861.61	-0.02	-5.68							1879.96
						1765.083	-3.14						1861.54	0.63	-5.8							1879.88
						1764.917	-3.21						1861.46	0.44	-5.83							1879.79
						1764.75	-3.27						1861.39	0.66	-5.77							1879.71
						1764.583	-3.34						1861.32	0.51	-5.38							1879.63
						1764.417	-3.45						1861.25	0.69	-5.56							1879.54
						1764.25	-3.7						1861.18	0.4	-5.53							1879.46
						1764.083	-2.91						1861.11	0.12	-5.54							1879.38
						1763.917	-3.4						1861.04	0.14	-6.05							1879.29
						1763.75	-3.46						1860.96	-0.15	-5.99							1879.21
						1763.583	-3.46						1860.89	0	-6							1879.13
						1763.417	-3.43						1860.75	0.35	-6.05							1879.04
						1763.25	-3						1860.63	0.21	-5.69							1878.96

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.324					1976.131	6.24E-06	1884.42	9.58	24.19	-0.42						1770.625	-1.2	-4.19	
-4.295					1976.108	5.91E-06	1884.34	9.52	24.87	-0.42						1770.458	-1.04	-4.45	
-4.383					1976.086	6.91E-06	1884.25	9.45	25.74	-0.43						1770.291	-0.44	-4.95	
-4.575					1976.064	6.96E-06	1884.17	9.34	27.11	-0.43						1770.125	-0.02	-5.1	
-4.754					1976.041	6.43E-06	1884.09	9.36	26.87	-0.43						1769.958	-0.08	-4.73	
-4.839					1976.019	6.01E-06	1884	9.39	26.4	-0.44						1769.791	-0.25	-4.24	
-4.661					1975.997	5.74E-06	1883.92	9.42	26.14	-0.44						1769.625	-0.87	-4.17	
-4.661					1975.974	5.84E-06	1883.84	9.47	25.48	-0.44						1769.458	-0.29	-4.5	
-4.697					1975.952	4.82E-06	1883.75	9.56	24.4	-0.45						1769.291	-0.06	-4.88	
-4.721					1975.93	4.94E-06	1883.67	9.55	24.52	-0.45						1769.125	-0.19	-5.32	
-4.683					1975.907	4.7E-06	1883.59	9.49	25.21	-0.45						1768.958	-0.28	-4.9	
-4.609					1975.885	4.54E-06	1883.5	9.48	25.33	-0.45						1768.791	-0.28	-4.37	
-4.573					1975.863	4.5E-06	1883.42	9.39	26.42	-0.46						1768.625	-0.21	-3.73	
-4.415					1975.84	4.4E-06	1883.34	9.33	27.18	-0.46						1768.458	-0.33	-4.05	
-4.493					1975.818	4.32E-06	1883.25	9.37	26.66	-0.46						1768.291	-0.4	-4.83	
-4.579					1975.796	4.43E-06	1883.17	9.36	26.84	-0.46						1768.125	-0.4	-4.91	
-4.68					1975.773	4.45E-06	1883.09	9.43	25.93	-0.46						1767.958	-0.24	-4.32	
-4.741					1975.751	4.43E-06	1883	9.41	26.2	-0.47						1767.791	-0.49	-4.02	
-4.8					1975.729	4.61E-06	1882.92	9.51	25.02	-0.47						1767.625	-0.46	-4.01	
-4.731					1975.706	4.33E-06	1882.84	9.58	24.1	-0.47						1767.458	-0.14	-4.4	
-4.599					1975.684	4.23E-06	1882.75	9.6	23.95	-0.47						1767.291	0.07	-4.75	
-4.542					1975.662	4.35E-06	1882.67	9.62	23.67	-0.47						1767.125	-0.14	-4.68	
-4.508					1975.639	4.42E-06	1882.59	9.59	24.07	-0.47						1766.958	-0.5	-4.36	
-4.46					1975.617	4.53E-06	1882.5	9.54	24.61	-0.48						1766.791	-0.67	-4.11	
-4.337					1975.595	4.41E-06	1882.42	9.45	25.73	-0.48						1766.625	-0.75	-4.02	
-4.172					1975.572	4.67E-06	1882.34	9.41	26.24	-0.48						1766.458	-0.32	-4.35	
-4.217					1975.55	5.1E-06	1882.25	9.4	26.29	-0.48						1766.291	-0.2	-4.8	
-4.335					1975.529	4.99E-06	1882.17	9.42	26.14	-0.48						1766.125	-0.25	-4.85	
-4.568					1975.507	4.7E-06	1882.09	9.41	26.2	-0.48						1765.958	-0.31	-4.55	
-4.733					1975.486	4.69E-06	1882	9.43	26.01	-0.48						1765.791	-0.35	-4.17	
-4.825					1975.465	4.98E-06	1881.92	9.44	25.91	-0.48						1765.625	-0.51	-3.75	
-4.776					1975.444	4.95E-06	1881.84	9.49	25.19	-0.48						1765.458	-0.19	-4.35	
-4.709					1975.422	5.31E-06	1881.75	9.52	24.84	-0.48						1765.291	0.03	-4.66	
-4.727					1975.401	5.19E-06	1881.67	9.57	24.27	-0.48						1765.125	-0.03	-4.65	
-4.731					1975.38	5.42E-06	1881.59	9.55	24.54	-0.48						1764.958	-0.22	-4.42	
-4.725					1975.359	5.21E-06	1881.5	9.5	25.16	-0.48						1764.791	-0.34	-4.1	
-4.569					1975.337	5.56E-06	1881.42	9.46	25.64	-0.48						1764.625	-0.5	-3.8	
-4.449					1975.316	5.46E-06	1881.34	9.41	26.27	-0.47						1764.458	-0.47	-4.15	
-4.535					1975.295	5.48E-06	1881.25	9.38	26.61	-0.47						1764.291	-0.2	-4.69	
-4.697					1975.273	5.95E-06	1881.17	9.37	26.7	-0.47						1764.125	-0.13	-4.77	
-4.893					1975.252	5.88E-06	1881.09	9.43	25.99	-0.47						1763.958	-0.21	-4.48	
-5.006					1975.231	6.16E-06	1881	9.46	25.61	-0.47						1763.791	-0.27	-4.16	
-5.098					1975.21	6.9E-06	1880.92	9.51	25	-0.47						1763.625	-0.3	-3.79	
-4.962					1975.188	7.2E-06	1880.84	9.62	23.61	-0.47						1763.458	-0.05	-4.41	
-5.059					1975.167	6.56E-06	1880.75	9.6	23.91	-0.46						1763.291	-0.05	-4.66	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1763.083	-2.87						1860.5	0.42	-5.32							1878.88
						1762.917	-3.41						1860.38	0.22	-5.4							1878.79
						1762.75	-3.63						1860.25	-0.46	-6.09							1878.71
						1762.583	-3.67						1860.13	-0.61	-6.09							1878.63
						1762.417	-3.08						1860	-0.73	-6.03							1878.54
						1762.25	-2.92						1859.75	-1	-6.3							1878.46
						1762.083	-3.05						1859.64	-0.4	-6.2							1878.38
						1761.917	-3.76						1859.53	0.24	-5.54							1878.29
						1761.75	-3.48						1859.42	0.54	-5.36							1878.21
						1761.583	-3.32						1859.31	0.5	-5.17							1878.13
						1761.417	-3.09						1859.19	0.25	-5.41							1878.04
						1761.25	-2.94						1859.08	-0.47	-6.1							1877.96
						1761.083	-2.89						1858.97	-0.97	-6.33							1877.88
						1760.917	-3.14						1858.75	-0.77	-6.41							1877.79
						1760.75	-3.4						1858.67	-0.45	-6.12							1877.71
						1760.583	-3.68						1858.6	-0.11	-6.23							1877.63
						1760.417	-3.76						1858.52	-0.18	-6.06							1877.54
						1760.25	-3.32						1858.44	-0.25	-5.79							1877.46
						1760.083	-2.74						1858.37	0.24	-5.71							1877.38
						1759.917	-3.3						1858.29	0.63	-5.49							1877.29
						1759.75	-3.61						1858.21	0.2	-5.46							1877.21
						1759.583	-3.97						1858.13	-0.01	-5.82							1877.13
						1759.417	-3.43						1858.06	-0.47	-6.06							1877.04
						1759.25	-3.29						1857.98	-0.85	-6.05							1876.96
						1759.083	-2.97						1857.9	-0.61	-6.04							1876.88
						1758.917	-2.99						1857.75	-0.18	-6.21							1876.79
						1758.75	-3.34						1857.64	0.31	-5.83							1876.71
						1758.583	-3.45						1857.53	0.37	-5.69							1876.63
						1758.417	-3.37						1857.42	0.24	-5.32							1876.54
						1758.25	-2.95						1857.31	0.57	-5.46							1876.46
						1758.083	-2.92						1857.19	0.79	-5.71							1876.38
						1757.917	-3.55						1857.08	1.3	-6.06							1876.29
						1757.75	-3.75						1856.97	0.57	-6.34							1876.21
						1757.583	-3.36						1856.75	-0.11	-6.84							1876.13
						1757.417	-3.07						1856.66	-0.47	-6.55							1876.04
						1757.25	-2.94						1856.57	-0.49	-6.4							1875.96
						1757.083	-2.96						1856.48	0.07	-6.35							1875.88
						1756.917	-3.18						1856.39	-0.34	-6.24							1875.79
						1756.75	-3.36						1856.3	-0.15	-5.89							1875.71
						1756.583	-3.54						1856.2	-0.11	-5.86							1875.63
						1756.417	-3.48						1856.11	0.08	-5.79							1875.54
						1756.25	-2.97						1856.02	0.06	-5.68							1875.46
						1756.083	-2.48						1855.93	-0.03	-6.17							1875.38
						1755.917	-2.53						1855.75	-0.19	-6.37							1875.29
						1755.75	-2.71						1855.65	-0.26	-6.09							1875.21

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.814					1975.146	5.68E-06	1880.67	9.69	22.82	-0.46						1763.125	-0.22	-4.72	
-4.784					1975.124	4.27E-06	1880.59	9.6	23.93	-0.46						1762.958	-0.43	-4.58	
-4.75					1975.103	4.12E-06	1880.5	9.56	24.36	-0.45						1762.791	-0.47	-4.25	
-4.689					1975.082	0.000004	1880.42	9.46	25.58	-0.45						1762.625	-0.09	-3.92	
-4.565					1975.061	3.9E-06	1880.34	9.35	26.95	-0.45						1762.458	-0.02	-4.44	
-4.779					1975.039	4.31E-06	1880.25	9.36	26.85	-0.44						1762.291	0.16	-4.73	
-5.112					1975.018	4.09E-06	1880.17	9.36	26.84	-0.44						1762.125	0.17	-4.66	
-5.214					1974.997	4.11E-06	1880.09	9.38	26.58	-0.43						1761.958	0.08	-4.37	
-5.258					1974.976	4.01E-06	1880	9.46	25.65	-0.43						1761.791	-0.03	-4.08	
-5.215					1974.954	4.24E-06	1879.92	9.58	24.21	-0.43						1761.625	-0.3	-3.82	
-5.158					1974.933	4.36E-06	1879.84	9.58	24.15	-0.42						1761.458	-0.13	-4.1	
-4.963					1974.912	4.49E-06	1879.75	9.58	24.11	-0.42						1761.291	0.08	-4.56	
-4.881					1974.89	4.57E-06	1879.67	9.61	23.79	-0.41						1761.125	0.06	-4.66	
-4.877					1974.869	4.93E-06	1879.59	9.57	24.32	-0.41						1760.958	-0.13	-4.36	
-4.744					1974.848	4.63E-06	1879.5	9.47	25.47	-0.41						1760.791	-0.28	-3.96	
-4.699					1974.827	4.88E-06	1879.42	9.38	26.52	-0.4						1760.625	-0.25	-3.78	
-4.664					1974.805	4.94E-06	1879.34	9.36	26.78	-0.4						1760.458	-0.31	-4.15	
-4.876					1974.784	4.96E-06	1879.25	9.32	27.32	-0.4						1760.291	-0.19	-4.63	
-4.99					1974.763	5.15E-06	1879.17	9.32	27.35	-0.4						1760.125	-0.05	-4.87	
-5.018					1974.741	5.21E-06	1879.09	9.33	27.16	-0.39						1759.958	-0.31	-4.75	
-4.927					1974.72	5.59E-06	1879	9.36	26.8	-0.39						1759.791	-0.32	-4.25	
-4.817					1974.699	5.49E-06	1878.92	9.4	26.38	-0.39						1759.625	-0.14	-4	
-4.804					1974.678	5.75E-06	1878.84	9.45	25.69	-0.39						1759.458	-0.21	-4.3	
-4.719					1974.656	5.68E-06	1878.75	9.58	24.19	-0.39						1759.291	-0.03	-4.63	
-4.681					1974.635	5.72E-06	1878.67	9.58	24.15	-0.4						1759.125	0.03	-4.77	
-4.631					1974.614	5.52E-06	1878.59	9.51	25.02	-0.4						1758.958	-0.06	-4.64	
-4.531					1974.593	5.49E-06	1878.5	9.47	25.47	-0.4						1758.791	-0.14	-4.32	
-4.405					1974.571	5.21E-06	1878.42	9.38	26.55	-0.4						1758.625	-0.21	-4.02	
-4.339					1974.55	5.59E-06	1878.34	9.35	26.93	-0.4						1758.458	-0.38	-4.16	
-4.4					1974.528	5.56E-06	1878.25	9.31	27.42	-0.41						1758.291	-0.24	-4.53	
-4.654					1974.506	5.23E-06	1878.17	9.3	27.52	-0.41						1758.125	-0.33	-4.77	
-4.833					1974.483	5.68E-06	1878.09	9.4	26.29	-0.41						1757.958	-0.48	-4.68	
-4.794					1974.461	0.000006	1878	9.52	24.93	-0.41						1757.791	-0.44	-4.32	
-4.702					1974.439	6.39E-06	1877.92	9.57	24.26	-0.41						1757.625	-0.41	-3.95	
-4.754					1974.417	6.69E-06	1877.84	9.56	24.34	-0.42						1757.458	-0.53	-4.09	
-4.692					1974.394	6.41E-06	1877.75	9.6	23.91	-0.42						1757.291	-0.48	-4.45	
-4.613					1974.372	7.44E-06	1877.67	9.63	23.55	-0.42						1757.125	-0.17	-4.83	
-4.588					1974.35	7.19E-06	1877.59	9.62	23.63	-0.42						1756.958	-0.18	-4.46	
-4.467					1974.328	7.14E-06	1877.5	9.59	24.08	-0.41						1756.791	-0.44	-4.14	
-4.377					1974.306	7.06E-06	1877.42	9.52	24.82	-0.41						1756.625	-0.38	-3.72	
-4.342					1974.283	7.21E-06	1877.34	9.46	25.58	-0.41						1756.458	-0.36	-4.23	
-4.498					1974.261	7.34E-06	1877.25	9.43	26.03	-0.4						1756.291	-0.18	-4.63	
-4.748					1974.239	1E-05	1877.17	9.38	26.62	-0.4						1756.125	-0.17	-4.7	
-4.868					1974.217	1.14E-05	1877.09	9.39	26.43	-0.39						1755.958	-0.17	-4.46	
-4.728					1974.194	1.23E-05	1877	9.45	25.72	-0.39						1755.791	-0.09	-4.13	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
						1755.583	-3.51						1855.55	0.19	-6.08							1875.13
						1755.417	-3.22						1855.45	0.37	-5.92							1875.04
						1755.25	-3.1						1855.35	0.42	-5.46							1874.96
						1755.083	-2.87						1855.25	0.13	-5.35							1874.88
						1754.917	-2.89						1855.15	0.02	-5.49							1874.79
						1754.75	-3.06						1855.05	0.11	-5.53							1874.71
						1754.583	-3.37						1854.95	-0.02	-5.86							1874.63
						1754.417	-3.55						1854.75	-0.43	-6.31							1874.54
						1754.25	-3.45						1854.67	-0.59	-6.25							1874.46
						1754.083	-3.05						1854.58	0.08	-6.12							1874.38
						1753.917	-3.19						1854.5	0.55	-6.03							1874.29
						1753.75	-3.17						1854.42	0.67	-6.06							1874.21
						1753.583	-3.59						1854.33	0.18	-5.73							1874.13
						1753.417	-3.52						1854.25	0.79	-5.3							1874.04
						1753.25	-2.98						1854.17	0.93	-5.68							1873.96
						1753.083	-2.97						1854.08	0.56	-6.03							1873.88
						1752.917	-3.33						1854	0.08	-6.14							1873.79
						1752.75	-3.65						1853.92	-0.04	-6.26							1873.71
						1752.583	-3.5						1853.75	0	-6.28							1873.63
						1752.417	-3.21						1853.63	0.5	-6.01							1873.54
						1752.25	-3.02						1853.5	0.57	-5.75							1873.46
						1752.083	-2.79						1853.38	0.47	-5.42							1873.38
						1751.917	-3.09						1853.25	0.38	-5.56							1873.29
						1751.75	-3.35						1853.13	0.28	-5.6							1873.21
						1751.583	-3.61						1853	0.15	-5.78							1873.13
						1751.417	-3.41						1852.75	0.17	-6							1873.04
						1751.25	-3.01						1852.66	0.24	-5.89							1872.96
						1751.083	-2.79						1852.57	0.08	-5.57							1872.88
													1852.48	-0.01	-5.31							1872.79
													1852.39	-0.09	-5.48							1872.71
													1852.3	0.18	-5.47							1872.63
													1852.2	0.31	-5.55							1872.54
													1852.11	-0.14	-5.8							1872.46
													1852.02	0.02	-5.9							1872.38
													1851.93	0	-5.94							1872.29
													1851.75	0.14	-6.21							1872.21
													1851.65	0.14	-6.16							1872.13
													1851.55	0.19	-5.99							1872.04
													1851.45	0.31	-5.8							1871.96
													1851.35	0.45	-5.61							1871.88
													1851.25	0.37	-5.52							1871.79
													1851.15	0.61	-5.63							1871.71
													1851.05	0.41	-6.04							1871.63
													1850.95	0.1	-6.14							1871.54
													1850.75	-0.29	-6.37							1871.46

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.762					1974.172	1.02E-05	1876.92	9.54	24.64	-0.38						1755.625	-0.44	-4.04	
-4.737					1974.15	9.68E-06	1876.84	9.61	23.84	-0.37						1755.458	-0.19	-4.42	
-4.691					1974.128	9.43E-06	1876.75	9.62	23.63	-0.36						1755.291	0.03	-4.89	
-4.626					1974.106	9.5E-06	1876.67	9.61	23.79	-0.35						1755.125	-0.11	-4.87	
-4.589					1974.083	9.22E-06	1876.59	9.57	24.29	-0.34						1754.958	-0.36	-4.54	
-4.56					1974.061	7.48E-06	1876.5	9.52	24.86	-0.33						1754.791	-0.39	-4.26	
-4.492					1974.039	5.18E-06	1876.42	9.44	25.88	-0.31						1754.625	-0.26	-3.95	
-4.364					1974.017	4.28E-06	1876.34	9.42	26.12	-0.3						1754.458	-0.09	-4.23	
-4.535					1973.994	4.13E-06	1876.25	9.38	26.6	-0.28						1754.291	0.02	-4.76	
-4.795					1973.972	4.12E-06	1876.17	9.36	26.83	-0.27						1754.125	0.02	-4.95	
-4.89					1973.95	3.99E-06	1876.09	9.37	26.73	-0.26						1753.958	-0.1	-4.73	
-4.788					1973.928	4.04E-06	1876	9.39	26.47	-0.24						1753.791	-0.22	-4.31	
-4.69					1973.906	4.03E-06	1875.92	9.46	25.66	-0.22						1753.625	-0.09	-3.86	
-4.738					1973.883	3.83E-06	1875.84	9.5	25.14	-0.21						1753.458	-0.46	-4.07	
-4.766					1973.861	3.8E-06	1875.75	9.56	24.44	-0.19						1753.291	-0.24	-4.57	
-4.692					1973.839	3.73E-06	1875.67	9.53	24.76	-0.18						1753.125	-0.08	-4.8	
-4.653					1973.817	3.88E-06	1875.59	9.56	24.44	-0.16						1752.958	-0.19	-4.72	
-4.57					1973.794	3.98E-06	1875.5	9.47	25.46	-0.14						1752.791	-0.51	-4.48	
-4.482					1973.772	3.8E-06	1875.42	9.4	26.31	-0.13						1752.625	-0.78	-4.08	
-4.501					1973.75	3.95E-06	1875.34	9.38	26.57	-0.11						1752.458	-0.46	-4.76	
-4.495					1973.728	3.87E-06	1875.25	9.31	27.43	-0.1						1752.291	-0.34	-4.8	
-4.649					1973.706	4.14E-06	1875.17	9.34	27.03	-0.08						1752.125	-0.4	-4.62	
-4.884					1973.683	4.17E-06	1875.09	9.34	27.03	-0.06						1751.958	-0.44	-4.4	
-4.926					1973.661	4.64E-06	1875	9.41	26.19	-0.05						1751.791	-0.38	-4.17	
-4.899					1973.639	4.74E-06	1874.92	9.44	25.81	-0.03						1751.625	-0.42	-3.9	
-4.821					1973.617	4.67E-06	1874.84	9.5	25.14	-0.02						1751.458	-0.39	-4.34	
-4.757					1973.594	4.6E-06	1874.75	9.55	24.52	0						1751.291	0.12	-4.72	
-4.696					1973.572	4.4E-06	1874.67	9.57	24.27	0.01						1751.125	0.01	-4.66	
-4.65					1973.55	4.23E-06	1874.59	9.51	25.04	0.02						1750.958	-0.42	-4.34	
-4.615					1973.531	3.93E-06	1874.5	9.42	26.08	0.04						1750.791	-0.59	-4.07	
-4.513					1973.513	4.31E-06	1874.42	9.34	27.07	0.05						1750.625	-0.71	-3.97	
-4.305					1973.494	4.43E-06	1874.34	9.34	27.03	0.07						1750.458	-0.37	-4.37	
-4.353					1973.476	4.32E-06	1874.25	9.33	27.18	0.08						1750.291	-0.04	-4.64	
-4.562					1973.457	4.67E-06	1874.17	9.31	27.39	0.09						1750.125	-0.06	-4.6	
-4.757					1973.439	4.44E-06	1874.09	9.34	27.06	0.1						1749.958	-0.2	-4.36	
-4.865					1973.42	4.29E-06	1874	9.37	26.68	0.11						1749.791	-0.22	-4.16	
-4.84					1973.402	4.08E-06	1873.92	9.4	26.34	0.13						1749.625	-0.37	-4.14	
-4.81					1973.383	4.12E-06	1873.84	9.41	26.23	0.14						1749.458	-0.12	-4.62	
-4.763					1973.365	4.07E-06	1873.75	9.47	25.53	0.15						1749.291	0	-4.75	
-4.659					1973.346	4.31E-06	1873.67	9.55	24.52	0.16						1749.125	-0.05	-4.6	
-4.661					1973.328	4.83E-06	1873.59	9.54	24.65	0.17						1748.958	-0.18	-4.35	
-4.592					1973.309	4.24E-06	1873.5	9.52	24.93	0.18						1748.791	-0.31	-4.14	
-4.439					1973.291	4.19E-06	1873.42	9.48	25.34	0.19						1748.625	-0.4	-4.03	
-4.31					1973.272	4.19E-06	1873.34	9.45	25.67	0.2						1748.458	-0.33	-4.49	
-4.367					1973.254	4.07E-06	1873.25	9.36	26.8	0.21						1748.291	-0.23	-4.73	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1850.64	0.07	-6.15							1871.38
													1850.53	0.26	-5.75							1871.29
													1850.42	0.41	-5.72							1871.21
													1850.31	0.48	-5.58							1871.13
													1850.19	0.7	-5.23							1871.04
													1850.08	0.13	-5.5							1870.96
													1849.97	-0.14	-5.9							1870.88
													1849.75	-0.28	-6.11							1870.79
													1849.66	-0.42	-6.02							1870.71
													1849.48	0.13	-5.92							1870.63
													1849.39	0	-5.62							1870.54
													1849.3	0.18	-5.45							1870.46
													1849.2	0.03	-5.52							1870.38
													1849.11	0	-5.43							1870.29
													1849.02	0.04	-5.52							1870.21
													1848.93	-0.23	-6.02							1870.13
													1848.75	-0.54	-6.19							1870.04
													1848.66	-0.82	-6.09							1869.96
													1848.57	-0.72	-6.03							1869.88
													1848.48	-0.38	-6.06							1869.79
													1848.39	-0.06	-5.84							1869.71
													1848.3	-0.11	-5.42							1869.63
													1848.2	0.07	-5.13							1869.54
													1848.11	-0.05	-5.19							1869.46
													1848.02	-0.13	-5.51							1869.38
													1847.93	-0.51	-5.94							1869.29
													1847.75	-0.5	-6.25							1869.21
													1847.67	-0.89	-6.25							1869.13
													1847.6	-0.5	-6.03							1869.04
													1847.52	0.28	-5.87							1868.96
													1847.44	0.05	-5.44							1868.88
													1847.37	-0.07	-5.38							1868.79
													1847.29	0.43	-5.54							1868.71
													1847.21	0.11	-5.61							1868.63
													1847.13	-0.06	-5.69							1868.54
													1847.06	0.2	-5.7							1868.46
													1846.98	0.36	-5.96							1868.38
													1846.9	-0.34	-5.98							1868.29
													1846.75	-0.37	-6.05							1868.21
													1846.63	0.61	-5.52							1868.13
													1846.5	0.55	-5.24							1868.04
													1846.38	0.67	-5.05							1867.96
													1846.25	0.6	-5.08							1867.88
													1846.13	0.4	-5.78							1867.79
													1846	0.32	-6							1867.71

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.507					1973.235	4.33E-06	1873.17	9.34	27.03	0.22						1748.125	-0.11	-4.76	
-4.744					1973.217	4.41E-06	1873.09	9.33	27.19	0.23						1747.958	-0.24	-4.53	
-4.789					1973.198	5.17E-06	1873	9.34	27.01	0.24						1747.791	-0.28	-4.27	
-4.567					1973.18	5.46E-06	1872.92	9.43	26.02	0.25						1747.625	-0.21	-3.97	
-4.67					1973.161	4.88E-06	1872.84	9.52	24.84	0.26						1747.458	-0.35	-4.29	
-4.71					1973.143	4.52E-06	1872.75	9.58	24.15	0.27						1747.291	-0.01	-4.62	
-4.672					1973.124	3.96E-06	1872.67	9.56	24.4	0.28						1747.125	0.02	-4.71	
-4.528					1973.106	3.85E-06	1872.59	9.53	24.8	0.29						1746.958	-0.15	-4.52	
-4.417					1973.087	3.86E-06	1872.5	9.46	25.65	0.3						1746.791	-0.21	-4.19	
-4.332					1973.069	3.95E-06	1872.42	9.42	26.13	0.31						1746.625	-0.34	-3.87	
-4.227					1973.05	3.76E-06	1872.34	9.37	26.76	0.32						1746.458	-0.2	-4.23	
-4.316					1973.031	3.67E-06	1872.25	9.32	27.28	0.33						1746.291	-0.02	-4.69	
-4.563					1973.013	3.6E-06	1872.17	9.33	27.19	0.34						1746.125	-0.04	-4.71	
-4.749					1972.994	3.48E-06	1872.09	9.37	26.69	0.35						1745.958	-0.2	-4.4	
-4.847					1972.976	3.86E-06	1872	9.39	26.44	0.35						1745.791	-0.33	-4.09	
-4.859					1972.957	4.09E-06	1871.92	9.4	26.39	0.36						1745.625	-0.35	-3.81	
-4.769					1972.939	4.42E-06	1871.84	9.4	26.29	0.37						1745.458	-0.24	-4.01	
-4.766					1972.92	4.25E-06	1871.75	9.43	25.95	0.38						1745.291	-0.13	-4.35	
-4.67					1972.902	4.3E-06	1871.67	9.46	25.61	0.38						1745.125	-0.02	-4.83	
-4.557					1972.883	4.2E-06	1871.59	9.36	26.88	0.39						1744.958	-0.04	-4.54	
-4.465					1972.865	4.19E-06	1871.5	9.49	25.29	0.39						1744.791	-0.1	-4.22	
-4.382					1972.846	3.98E-06	1871.42	9.45	25.76	0.4						1744.625	-0.2	-3.89	
-4.37					1972.828	3.78E-06	1871.34	9.42	26.14	0.4						1744.458	-0.5	-3.98	
-4.464					1972.809	3.64E-06	1871.25	9.34	27.01	0.41						1744.291	-0.1	-4.53	
-4.72					1972.791	3.93E-06	1871.17	9.29	27.64	0.41						1744.125	-0.08	-4.8	
-4.972					1972.772	4.15E-06	1871.09	9.28	27.77	0.41						1743.958	-0.23	-4.52	
-5.085					1972.754	4.28E-06	1871	9.34	27.05	0.41						1743.791	-0.16	-4.17	
-4.987					1972.735	4.23E-06	1870.92	9.37	26.7	0.41						1743.625	-0.49	-4.14	
-4.817					1972.717	4.25E-06	1870.84	9.45	25.69	0.41						1743.458	-0.49	-4.42	
-4.752					1972.698	4.28E-06	1870.75	9.46	25.57	0.41						1743.291	-0.1	-4.6	
-4.761					1972.68	4.46E-06	1870.67	9.49	25.25	0.41						1743.125	-0.1	-4.47	
-4.74					1972.661	4.8E-06	1870.59	9.48	25.33	0.4						1742.958	-0.23	-4.25	
-4.685					1972.643	4.56E-06	1870.5	9.47	25.47	0.4						1742.791	-0.14	-4.15	
-4.508					1972.624	4.6E-06	1870.42	9.45	25.77	0.4						1742.625	-0.33	-3.87	
-4.39					1972.606	5.01E-06	1870.34	9.39	26.45	0.39						1742.458	-0.25	-4.6	
-4.53					1972.587	5.19E-06	1870.25	9.33	27.17	0.39						1742.291	-0.16	-4.89	
-4.829					1972.569	5.15E-06	1870.17	9.29	27.72	0.38						1742.125	-0.05	-4.73	
-4.912					1972.55	5.45E-06	1870.09	9.28	27.74	0.37						1741.958	-0.13	-4.36	
-4.857					1972.527	5.51E-06	1870	9.27	27.96	0.36						1741.791	-0.28	-4.1	
-4.821					1972.505	5.44E-06	1869.92	9.35	26.95	0.36						1741.625	-0.5	-3.95	
-4.754					1972.482	5.52E-06	1869.84	9.38	26.57	0.35						1741.458	-0.36	-4.34	
-4.794					1972.459	5.45E-06	1869.75	9.46	25.65	0.34						1741.291	-0.15	-4.67	
-4.754					1972.436	6.28E-06	1869.67	9.54	24.64	0.32						1741.125	-0.2	-4.72	
-4.715					1972.414	6.74E-06	1869.59	9.56	24.44	0.31						1740.958	-0.33	-4.51	
-4.639					1972.391	6.93E-06	1869.5	9.47	25.45	0.3						1740.791	-0.38	-4.19	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1845.75	-0.24	-6.18							1867.63
													1845.66	0.12	-5.9							1867.54
													1845.57	-0.06	-5.69							1867.46
													1845.48	0.35	-5.86							1867.38
													1845.39	-0.06	-5.57							1867.29
													1845.3	-0.15	-5.4							1867.21
													1845.2	0.13	-5.37							1867.13
													1845.11	0.06	-5.66							1867.04
													1845.02	0.26	-5.81							1866.96
													1844.93	-0.12	-6.05							1866.88
													1844.75	-0.59	-6.23							1866.79
													1844.66	0.22	-6.12							1866.71
													1844.57	0.18	-6.1							1866.63
													1844.48	0.47	-6.11							1866.54
													1844.39	0.29	-5.83							1866.46
													1844.3	0.81	-5.66							1866.38
													1844.2	0.5	-5.56							1866.29
													1844.11	0.31	-5.58							1866.21
													1844.02	-0.06	-5.82							1866.13
													1843.93	-0.22	-6.11							1866.04
													1843.75	-0.59	-6.32							1865.96
													1843.67	-0.34	-6.15							1865.88
													1843.58	-0.1	-5.99							1865.79
													1843.5	-0.02	-6.05							1865.71
													1843.42	-0.01	-5.67							1865.63
													1843.33	0.22	-5.72							1865.54
													1843.25	0.5	-5.4							1865.46
													1843.17	0.25	-5.3							1865.38
													1843.08	0.16	-5.52							1865.29
													1843	-0.13	-5.75							1865.21
													1842.92	-0.95	-6.21							1865.13
													1842.75	-0.54	-6.25							1865.04
													1842.66	-0.59	-6.24							1864.96
													1842.57	-0.47	-6.24							1864.88
													1842.48	-0.11	-6.07							1864.79
													1842.39	0.29	-5.72							1864.71
													1842.3	0.06	-5.55							1864.63
													1842.2	0.57	-5.57							1864.54
													1842.11	0.4	-5.63							1864.46
													1842.02	0.59	-5.92							1864.38
													1841.93	-0.18	-6.1							1864.29
													1841.75	-0.68	-6.23							1864.21
													1841.68	-0.26	-6.09							1864.13
													1841.62	0	-5.9							1864.04
													1841.55	0.7	-5.78							1863.96

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.533					1972.368	6.57E-06	1869.42	9.38	26.52	0.29						1740.625	-0.68	-3.96	
-4.499					1972.345	7.32E-06	1869.34	9.31	27.47	0.28						1740.458	-0.68	-4.31	
-4.541					1972.323	8.51E-06	1869.25	9.31	27.46	0.26						1740.291	-0.33	-4.69	
-4.713					1972.3	8.89E-06	1869.17	9.33	27.24	0.25						1740.125	-0.02	-4.76	
-4.817					1972.277	8.47E-06	1869.09	9.34	27.1	0.23						1739.958	0.1	-4.56	
-4.885					1972.255	7.96E-06	1869	9.36	26.84	0.22						1739.791	0.01	-4.28	
-4.807					1972.232	7.62E-06	1868.92	9.46	25.56	0.2						1739.625	-0.32	-3.89	
-4.824					1972.209	6.91E-06	1868.84	9.54	24.66	0.19						1739.458	-0.39	-4.2	
-4.86					1972.186	7.5E-06	1868.75	9.58	24.15	0.17						1739.291	-0.19	-4.6	
-4.711					1972.164	6.72E-06	1868.67	9.53	24.76	0.16						1739.125	-0.14	-4.75	
-4.662					1972.141	6.56E-06	1868.59	9.54	24.59	0.15						1738.958	-0.12	-4.55	
-4.598					1972.118	6.66E-06	1868.5	9.52	24.83	0.13						1738.791	-0.02	-4.14	
-4.407					1972.095	5.42E-06	1868.42	9.48	25.39	0.12						1738.625	-0.27	-3.82	
-4.427					1972.073	4.87E-06	1868.34	9.43	25.98	0.1						1738.458	-0.35	-4.36	
-4.488					1972.05	4.02E-06	1868.25	9.41	26.24	0.09						1738.291	-0.13	-4.71	
-4.618					1972.027	3.8E-06	1868.17	9.38	26.55	0.07						1738.125	-0.1	-4.69	
-4.88					1972.005	3.7E-06	1868.09	9.34	27.07	0.06						1737.958	-0.18	-4.46	
-4.873					1971.982	3.82E-06	1868	9.36	26.84	0.05						1737.791	-0.25	-4.23	
-4.847					1971.959	3.91E-06	1867.92	9.39	26.51	0.03						1737.625	-0.43	-3.98	
-4.812					1971.936	3.86E-06	1867.84	9.44	25.91	0.02						1737.458	-0.53	-4.36	
-4.726					1971.914	3.78E-06	1867.75	9.45	25.77	0						1737.291	-0.25	-4.82	
-4.747					1971.891	3.77E-06	1867.67	9.57	24.27	-0.01						1737.125	0.07	-4.85	
-4.703					1971.868	3.72E-06	1867.59	9.55	24.49	-0.03						1736.958	-0.15	-4.4	
-4.631					1971.845	3.88E-06	1867.5	9.55	24.54	-0.04						1736.791	-0.27	-4.14	
-4.621					1971.823	3.62E-06	1867.42	9.41	26.22	-0.06						1736.625	-0.58	-4.09	
-4.51					1971.8	3.82E-06	1867.34	9.35	26.97	-0.07						1736.458	-0.2	-4.39	
-4.626					1971.777	3.79E-06	1867.25	9.3	27.57	-0.08						1736.291	-0.11	-4.71	
-4.781					1971.755	4.16E-06	1867.17	9.29	27.68	-0.1						1736.125	-0.16	-4.77	
-4.909					1971.732	3.89E-06	1867.09	9.3	27.54	-0.11						1735.958	-0.3	-4.57	
-4.955					1971.709	3.88E-06	1867	9.34	27.06	-0.13						1735.791	-0.42	-4.29	
-4.938					1971.686	4.07E-06	1866.92	9.4	26.38	-0.14						1735.625	-0.07	-4.12	
-4.979					1971.664	4.13E-06	1866.84	9.42	26.04	-0.16						1735.458	-0.1	-4.39	
-4.871					1971.641	4.26E-06	1866.75	9.46	25.66	-0.17						1735.291	-0.14	-4.71	
-4.892					1971.618	4.32E-06	1866.67	9.53	24.76	-0.18						1735.125	-0.04	-4.77	
-4.777					1971.595	4.47E-06	1866.59	9.63	23.48	-0.2						1734.958	0.06	-4.58	
-4.716					1971.573	4.16E-06	1866.5	9.52	24.89	-0.21						1734.791	0	-4.32	
-4.573					1971.55	4.22E-06	1866.42	9.5	25.09	-0.22						1734.625	-0.13	-4.27	
-4.427					1971.531	4.86E-06	1866.34	9.46	25.62	-0.23						1734.458	-0.07	-4.44	
-4.538					1971.512	5.62E-06	1866.25	9.39	26.45	-0.24						1734.291	-0.02	-4.76	
-4.574					1971.493	5.58E-06	1866.17	9.37	26.72	-0.25						1734.125	0.02	-4.59	
-4.678					1971.475	5.06E-06	1866.09	9.41	26.22	-0.26						1733.958	-0.11	-4.55	
-4.716					1971.456	5.05E-06	1866	9.49	25.29	-0.27						1733.791	-0.28	-4.02	
-4.753					1971.437	5.4E-06	1865.92	9.57	24.33	-0.28						1733.625	0.12	-3.62	
-4.797					1971.418	5.39E-06	1865.84	9.62	23.65	-0.28						1733.458	-0.15	-3.76	
-4.787					1971.399	5.41E-06	1865.75	9.63	23.55	-0.29						1733.291	-0.22	-4.19	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1841.42	0.31	-5.49							1863.88
													1841.35	-0.11	-5.29							1863.79
													1841.28	0.06	-5.38							1863.71
													1841.22	-0.05	-5.43							1863.63
													1841.15	-0.09	-5.61							1863.54
													1841.08	-0.26	-5.89							1863.46
													1841.02	-0.7	-5.67							1863.38
													1840.95	-0.35	-5.87							1863.29
													1840.88	-0.05	-5.89							1863.21
													1840.75	-0.06	-5.98							1863.13
													1840.65	0.71	-5.62							1863.04
													1840.55	0.99	-5.37							1862.96
													1840.45	0.79	-5.1							1862.88
													1840.35	0.78	-5.1							1862.79
													1840.25	0.63	-5.26							1862.71
													1840.15	0.66	-5.55							1862.63
													1840.05	0.17	-5.93							1862.54
													1839.95	-0.65	-6.11							1862.46
													1839.75	-0.78	-6.2							1862.38
													1839.67	0.35	-5.94							1862.29
													1839.58	0.41	-5.79							1862.21
													1839.5	0.59	-5.63							1862.13
													1839.42	-0.02	-5.57							1862.04
													1839.33	0.19	-5.45							1861.96
													1839.25	0.06	-5.55							1861.88
													1839.17	-0.47	-5.71							1861.79
													1839.08	-0.37	-5.91							1861.71
													1839	-0.28	-5.9							1861.63
													1838.92	-0.51	-5.99							1861.54
													1838.75	-0.72	-6.13							1861.46
													1838.68	-0.65	-6.03							1861.38
													1838.61	-0.6	-6.07							1861.29
													1838.54	-0.53	-5.96							1861.21
													1838.46	-0.41	-5.85							1861.13
													1838.39	-0.12	-5.7							1861.04
													1838.32	0.05	-5.57							1860.96
													1838.25	0	-5.47							1860.88
													1838.18	-0.19	-5.5							1860.79
													1838.11	-0.22	-5.61							1860.71
													1838.04	-0.53	-5.85							1860.63
													1837.96	-0.82	-6.01							1860.54
													1837.89	-0.87	-6.08							1860.46
													1837.75	-0.83	-6.14							1860.38
													1837.67	-0.83	-6.09							1860.29
													1837.58	-0.64	-6.05							1860.21

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.734					1971.38	5.54E-06	1865.67	9.62	23.67	-0.29						1733.125	0.13	-4.83	
-4.619					1971.361	5.56E-06	1865.59	9.65	23.27	-0.29						1732.958	0.09	-4.39	
-4.545					1971.342	5.6E-06	1865.5	9.52	24.92	-0.29						1732.791	-0.1	-4.08	
-4.471					1971.324	5.78E-06	1865.42	9.43	25.98	-0.29						1732.625	-0.23	-3.78	
-4.345					1971.305	5.62E-06	1865.34	9.37	26.68	-0.29						1732.458	-0.28	-4.11	
-4.573					1971.286	5.77E-06	1865.25	9.38	26.62	-0.29						1732.291	-0.1	-4.58	
-4.821					1971.267	6.27E-06	1865.17	9.35	26.93	-0.29						1732.125	-0.01	-4.63	
-4.989					1971.248	6.97E-06	1865.09	9.37	26.66	-0.28						1731.958	-0.05	-4.39	
-4.942					1971.229	6.95E-06	1865	9.44	25.8	-0.28						1731.791	-0.12	-4.16	
-4.86					1971.21	6.44E-06	1864.92	9.49	25.29	-0.28						1731.625	-0.13	-3.88	
-4.65					1971.192	5.61E-06	1864.84	9.51	24.97	-0.27						1731.458	-0.08	-4.46	
-4.687					1971.173	5.58E-06	1864.75	9.53	24.75	-0.26						1731.291	-0.03	-4.56	
-4.666					1971.154	5.66E-06	1864.67	9.54	24.64	-0.26						1731.125	-0.16	-4.21	
-4.667					1971.135	5.12E-06	1864.59	9.57	24.32	-0.25						1730.958	-0.36	-4.23	
-4.63					1971.116	4.61E-06	1864.5	9.49	25.3	-0.24						1730.791	-0.41	-4	
-4.545					1971.097	4.29E-06	1864.42	9.43	26.01	-0.23						1730.625	-0.11	-3.85	
-4.478					1971.078	3.94E-06	1864.34	9.38	26.64	-0.22						1730.458	0.05	-4.09	
-4.619					1971.059	3.83E-06	1864.25	9.34	27.02	-0.21						1730.291	0.11	-4.57	
-4.754					1971.041	3.71E-06	1864.17	9.36	26.88	-0.2						1730.125	0.15	-4.71	
-4.816					1971.022	3.71E-06	1864.09	9.36	26.83	-0.19						1729.958	0.14	-4.56	
-4.849					1971.003	3.67E-06	1864	9.42	26.13	-0.18						1729.791	0.03	-4.3	
-4.865					1970.984	3.8E-06	1863.92	9.47	25.54	-0.17						1729.625	-0.29	-3.76	
-4.783					1970.965	3.81E-06	1863.84	9.5	25.08	-0.16						1729.458	-0.47	-4.12	
-4.735					1970.946	3.7E-06	1863.75	9.56	24.36	-0.15						1729.291	-0.31	-4.39	
-4.728					1970.927	3.68E-06	1863.67	9.58	24.15	-0.14						1729.125	0.07	-4.61	
-4.653					1970.908	3.76E-06	1863.59	9.58	24.16	-0.13						1728.958	0.23	-4.6	
-4.688					1970.89	3.95E-06	1863.5	9.56	24.39	-0.11						1728.791	-0.02	-4.28	
-4.508					1970.871	3.57E-06	1863.42	9.45	25.73	-0.1						1728.625	-0.09	-3.95	
-4.343					1970.852	3.7E-06	1863.34	9.37	26.67	-0.09						1728.458	-0.4	-4.02	
-4.415					1970.833	3.87E-06	1863.25	9.33	27.24	-0.08						1728.291	-0.07	-4.6	
-4.632					1970.814	3.85E-06	1863.17	9.35	26.96	-0.06						1728.125	0.3	-4.76	
-4.829					1970.795	4.07E-06	1863.09	9.38	26.61	-0.05						1727.958	0.03	-4.41	
-4.984					1970.776	4.02E-06	1863	9.38	26.58	-0.04						1727.791	0.06	-3.9	
-4.969					1970.758	3.86E-06	1862.92	9.48	25.35	-0.03						1727.625	-0.41	-3.89	
-4.695					1970.739	3.84E-06	1862.84	9.53	24.71	-0.02						1727.458	-0.14	-4.22	
-4.811					1970.72	3.79E-06	1862.75	9.58	24.15	-0.01						1727.291	-0.04	-4.47	
-4.745					1970.701	3.71E-06	1862.67	9.58	24.15	0.01						1727.125	-0.11	-4.62	
-4.716					1970.682	3.78E-06	1862.59	9.53	24.78	0.02						1726.958	-0.19	-4.35	
-4.655					1970.663	3.91E-06	1862.5	9.49	25.24	0.03						1726.791	-0.28	-4.07	
-4.477					1970.644	4.1E-06	1862.42	9.37	26.64	0.04						1726.625	-0.37	-3.77	
-4.231					1970.625	4.17E-06	1862.34	9.28	27.84	0.05						1726.458	-0.23	-3.8	
-4.465					1970.607	4.35E-06	1862.25	9.26	28.02	0.05						1726.291	-0.11	-4.23	
-4.892					1970.588	4.63E-06	1862.17	9.31	27.41	0.06						1726.125	-0.02	-4.61	
-5.028					1970.569	4.61E-06	1862.09	9.3	27.5	0.07						1725.958	-0.06	-4.58	
-4.976					1970.55	4.54E-06	1862	9.33	27.15	0.07						1725.791	-0.23	-4.13	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1837.5	-0.31	-5.75							1860.13
													1837.42	-0.24	-5.69							1860.04
													1837.33	-0.34	-5.38							1859.96
													1837.25	-0.29	-5.21							1859.88
													1837.17	-0.13	-5.31							1859.79
													1837.08	-0.12	-5.64							1859.71
													1837	-0.19	-5.82							1859.63
													1836.92	-0.61	-6.18							1859.54
													1836.75	-0.82	-6.34							1859.46
													1836.67	-0.56	-6.19							1859.38
													1836.6	-0.67	-6.12							1859.29
													1836.52	-0.45	-5.88							1859.21
													1836.44	-0.44	-5.65							1859.13
													1836.37	-0.46	-5.47							1859.04
													1836.29	-0.31	-5.35							1858.96
													1836.21	-0.2	-5.49							1858.88
													1836.13	-0.4	-5.54							1858.79
													1836.06	-0.67	-5.54							1858.71
													1835.98	-1.02	-5.67							1858.63
													1835.9	-0.57	-5.74							1858.54
													1835.75	-0.43	-5.86							1858.46
													1835.66	0	-5.81							1858.38
													1835.57	-0.37	-5.77							1858.29
													1835.48	-0.29	-5.64							1858.21
													1835.39	-0.22	-5.37							1858.13
													1835.3	0.09	-5.16							1858.04
													1835.2	0.15	-5.25							1857.96
													1835.11	0.11	-5.35							1857.88
													1835.02	-0.01	-5.39							1857.79
													1834.93	-0.65	-5.84							1857.71
													1834.75	-0.62	-5.96							1857.63
													1834.68	-0.38	-5.92							1857.54
													1834.61	-0.04	-5.87							1857.46
													1834.54	0.07	-5.72							1857.38
													1834.46	-0.03	-5.57							1857.29
													1834.39	0.25	-5.45							1857.21
													1834.32	0.53	-5.35							1857.13
													1834.25	0.42	-5.28							1857.04
													1834.18	0.46	-4.87							1856.96
													1834.11	0.3	-5.54							1856.88
													1834.04	0.07	-5.61							1856.79
													1833.96	0.05	-5.56							1856.71
													1833.89	0.05	-5.63							1856.63
													1833.75	0.14	-5.73							1856.54
													1833.65	1.81	-5.28							1856.46

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.802					1970.535	4.53E-06		1861.92	9.36	26.8	0.08						1725.625	-0.15	-3.81	
-4.829					1970.521	4.79E-06		1861.84	9.45	25.76	0.08						1725.458	-0.39	-3.93	
-4.793					1970.506	4.74E-06		1861.75	9.49	25.23	0.08						1725.291	-0.21	-4.59	
-4.722					1970.491	4.68E-06		1861.67	9.51	25	0.08						1725.125	0.15	-4.89	
-4.605					1970.476	4.49E-06		1861.59	9.54	24.7	0.09						1724.958	-0.05	-4.53	
-4.354					1970.462	4.55E-06		1861.5	9.58	24.13	0.09						1724.791	-0.37	-4.29	
-4.361					1970.447	4.8E-06		1861.42	9.49	25.21	0.09						1724.625	-0.37	-3.88	
-4.318					1970.432	4.77E-06		1861.34	9.4	26.33	0.08						1724.458	-0.23	-4.43	
-4.426					1970.418	4.84E-06		1861.25	9.3	27.6	0.08						1724.291	-0.16	-4.77	
-4.789					1970.403	4.96E-06		1861.17	9.26	27.99	0.08						1724.125	-0.09	-4.8	
-4.821					1970.388	4.76E-06		1861.09	9.27	27.95	0.08						1723.958	-0.06	-4.58	
-4.924					1970.374	4.69E-06		1861	9.32	27.34	0.07						1723.791	-0.15	-4.28	
-4.95					1970.359	4.88E-06		1860.92	9.36	26.81	0.07						1723.625	-0.37	-4.11	
-4.779					1970.344	4.8E-06		1860.84	9.44	25.8	0.06						1723.458	-0.15	-4.27	
-4.639					1970.329	4.92E-06		1860.75	9.45	25.73	0.05						1723.291	0.07	-4.75	
-4.686					1970.315	5.24E-06		1860.67	9.51	25	0.05						1723.125	-0.17	-4.98	
-4.606					1970.3	6.34E-06		1860.59	9.54	24.63	0.04						1722.958	-0.46	-4.59	
-4.603					1970.285	6.15E-06		1860.5	9.55	24.55	0.03						1722.791	-0.26	-4.2	
-4.548					1970.271	6.66E-06		1860.42	9.49	25.19	0.02						1722.625	-0.56	-4.04	
-4.441					1970.256	6.74E-06		1860.34	9.42	26.06	0.01						1722.458	-0.43	-4.19	
-4.537					1970.241	7.07E-06		1860.25	9.41	26.16	0						1722.291	-0.29	-4.51	
-4.769					1970.226	7.6E-06		1860.17	9.33	27.19	-0.01						1722.125	-0.21	-4.67	
-4.815					1970.212	8.26E-06		1860.09	9.39	26.46	-0.01						1721.958	-0.24	-4.6	
-4.825					1970.197	8.4E-06		1860	9.44	25.84	-0.02						1721.791	-0.35	-4.36	
-4.766					1970.182	8.25E-06		1859.92	9.45	25.73	-0.03						1721.625	-0.37	-4.08	
-4.787					1970.168	8.56E-06		1859.84	9.46	25.59	-0.04						1721.458	-0.69	-4.2	
-4.647					1970.153	9.01E-06		1859.75	9.55	24.52	-0.05						1721.291	-0.44	-4.54	
-4.633					1970.138	7.81E-06		1859.67	9.53	24.76	-0.06						1721.125	-0.29	-4.77	
-4.637					1970.124	6.6E-06		1859.59	9.53	24.72	-0.07						1720.958	-0.49	-4.56	
-4.555					1970.109	5.78E-06		1859.5	9.42	26.08	-0.08						1720.791	-0.6	-4.29	
-4.413					1970.094	4.71E-06		1859.42	9.36	26.79	-0.09						1720.625	-0.65	-4.03	
-4.305					1970.079	0.000004		1859.34	9.35	26.99	-0.1						1720.458	-0.8	-4.14	
-4.456					1970.065	3.6E-06		1859.25	9.32	27.26	-0.1						1720.291	-0.61	-4.5	
-4.756					1970.05	3.68E-06		1859.17	9.36	26.79	-0.11						1720.125	-0.41	-4.66	
-4.826					1970.035	3.66E-06		1859.09	9.42	26.13	-0.12						1719.958	-0.48	-4.5	
-4.845					1970.021	3.55E-06		1859	9.5	25.15	-0.13						1719.791	-0.56	-4.3	
-4.77					1970.006	3.61E-06		1858.92	9.56	24.42	-0.13						1719.625	-1.05	-4.06	
-4.834					1969.991	3.44E-06		1858.84	9.62	23.67	-0.14						1719.458	-0.98	-4.26	
-4.828					1969.976	3.39E-06		1858.75	9.62	23.67	-0.14						1719.291	-0.84	-4.65	
-4.812					1969.962	3.55E-06		1858.67	9.62	23.67	-0.15						1719.125	-0.69	-4.77	
-4.546					1969.947	3.56E-06		1858.59	9.58	24.16	-0.15						1718.958	-0.6	-4.52	
-4.455					1969.932	3.83E-06		1858.5	9.54	24.58	-0.15						1718.791	-0.65	-3.95	
-4.522					1969.918	3.68E-06		1858.42	9.39	26.4	-0.16						1718.625	-0.77	-3.41	
-4.399					1969.903	3.76E-06		1858.34	9.36	26.8	-0.16						1718.458	-1.18	-3.74	
-4.555					1969.888	3.79E-06		1858.25	9.33	27.22	-0.16						1718.291	-0.99	-4.27	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1833.55	1.75	-5.4							1856.38
													1833.45	1.34	-5.48							1856.29
													1833.35	1.76	-5.28							1856.21
													1833.25	1.24	-5.1							1856.13
													1833.15	0.84	-5.28							1856.04
													1833.05	0.47	-5.84							1855.96
													1832.95	0.2	-5.9							1855.88
													1832.75	0.52	-5.92							1855.79
													1832.64	1.19	-5.56							1855.71
													1832.53	1.19	-5.37							1855.63
													1832.42	0.9	-5.43							1855.54
													1832.31	0.36	-5.75							1855.46
													1832.19	0.13	-6.02							1855.38
													1832.08	0.2	-6.1							1855.29
													1831.75	-0.08	-6.13							1855.21
													1831.61	0.75	-5.95							1855.13
													1831.46	0.64	-5.75							1855.04
													1831.32	0.86	-5.47							1854.96
													1831.18	0.51	-5.61							1854.88
													1831.04	0.13	-5.95							1854.79
													1830.75	-0.11	-6.15							1854.71
													1830.67	-0.02	-6.13							1854.63
													1830.58	-0.18	-6							1854.54
													1830.5	0.13	-6.02							1854.46
													1830.42	0.36	-5.63							1854.38
													1830.33	0.7	-5.44							1854.29
													1830.25	0.57	-5.47							1854.21
													1830.17	-0.14	-5.7							1854.13
													1830.08	-0.42	-5.99							1854.04
													1830	-0.59	-5.94							1853.96
													1829.92	-0.14	-5.9							1853.88
													1829.75	-0.11	-6.01							1853.79
													1829.66	-0.03	-5.97							1853.71
													1829.57	-0.12	-5.8							1853.63
													1829.48	-0.27	-5.67							1853.54
													1829.39	0.12	-5.3							1853.46
													1829.3	0.49	-5.07							1853.38
													1829.2	0.54	-5.24							1853.29
													1829.11	0.4	-5.38							1853.21
													1829.02	0.36	-5.65							1853.13
													1828.93	0.03	-5.98							1853.04
													1828.75	-0.02	-6.08							1852.96
													1828.65	0.52	-5.82							1852.88
													1828.55	0.84	-5.78							1852.79
													1828.45	0.65	-5.58							1852.71

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.773					1969.874	3.66E-06	1858.17	9.34	27.07	-0.16						1718.125	-0.58	-4.4	
-4.939					1969.859	3.56E-06	1858.09	9.35	26.93	-0.16						1717.958	-0.31	-4.15	
-4.956					1969.844	3.73E-06	1858	9.38	26.6	-0.16						1717.791	-0.65	-3.93	
-4.98					1969.829	3.73E-06	1857.92	9.41	26.18	-0.16						1717.625	-0.8	-3.67	
-4.862					1969.815	3.6E-06	1857.84	9.46	25.56	-0.16						1717.458	-0.36	-4.61	
-4.837					1969.8	3.62E-06	1857.75	9.49	25.2	-0.16						1717.291	-0.3	-4.53	
-4.738					1969.785	3.64E-06	1857.67	9.54	24.64	-0.16						1717.125	-0.34	-4.15	
-4.721					1969.771	3.44E-06	1857.59	9.59	24.04	-0.16						1716.958	-0.39	-3.98	
-4.613					1969.756	3.63E-06	1857.5	9.58	24.2	-0.15						1716.791	-0.46	-3.71	
-4.55					1969.741	3.83E-06	1857.42	9.53	24.73	-0.15						1716.625	-0.35	-3.58	
-4.447					1969.726	3.82E-06	1857.34	9.49	25.25	-0.15						1716.458	-0.15	-4.19	
-4.669					1969.712	3.8E-06	1857.25	9.41	26.22	-0.15						1716.291	-0.08	-4.51	
-4.899					1969.697	3.85E-06	1857.17	9.35	26.99	-0.14						1716.125	-0.15	-4.55	
-4.914					1969.682	3.77E-06	1857.09	9.36	26.85	-0.14						1715.958	-0.22	-4.48	
-4.911					1969.668	3.77E-06	1857	9.38	26.59	-0.14						1715.791	-0.4	-4.27	
-4.841					1969.653	3.88E-06	1856.92	9.42	26.06	-0.13						1715.625	-0.67	-3.92	
-4.753					1969.638	4.06E-06	1856.84	9.48	25.31	-0.13						1715.458	-0.54	-4.26	
-4.784					1969.624	4.05E-06	1856.75	9.57	24.31	-0.12						1715.291	-0.25	-4.56	
-4.802					1969.609	3.98E-06	1856.67	9.6	23.91	-0.12						1715.125	-0.35	-4.73	
-4.722					1969.594	4.13E-06	1856.59	9.54	24.68	-0.12						1714.958	-0.49	-4.31	
-4.674					1969.579	3.89E-06	1856.5	9.46	25.65	-0.11						1714.791	-0.51	-4.21	
-4.701					1969.565	3.94E-06	1856.42	9.42	26.13	-0.11						1714.625	-0.63	-3.72	
-4.477					1969.55	4.02E-06	1856.34	9.36	26.83	-0.1						1714.458	-0.83	-3.86	
-4.61					1969.532	3.85E-06	1856.25	9.3	27.57	-0.1						1714.291	-0.72	-4.18	
-4.844					1969.515	3.94E-06	1856.17	9.26	28.01	-0.1						1714.125	0.04	-4.51	
-5.022					1969.497	3.94E-06	1856.09	9.32	27.33	-0.09						1713.958	-0.25	-4.52	
-4.803					1969.48	3.87E-06	1856	9.44	25.91	-0.09						1713.791	-0.92	-4.33	
-4.886					1969.462	3.84E-06	1855.92	9.55	24.47	-0.09						1713.625	-0.71	-3.73	
-4.779					1969.445	3.93E-06	1855.84	9.56	24.41	-0.09						1713.458	-0.65	-3.85	
-4.701					1969.427	3.87E-06	1855.75	9.57	24.32	-0.08						1713.291	-0.37	-4.35	
-4.604					1969.41	3.9E-06	1855.67	9.57	24.27	-0.08						1713.125	-0.13	-4.75	
-4.542					1969.392	4.1E-06	1855.59	9.58	24.09	-0.08						1712.958	-0.43	-4.69	
-4.469					1969.375	4.11E-06	1855.5	9.46	25.56	-0.08						1712.791	-0.65	-4.55	
-4.513					1969.357	3.88E-06	1855.42	9.4	26.28	-0.08						1712.625	-0.53	-4.14	
-4.305					1969.339	3.81E-06	1855.34	9.4	26.36	-0.08						1712.458	-0.76	-4.15	
-4.605					1969.322	3.7E-06	1855.25	9.39	26.42	-0.08						1712.291	-0.49	-4.22	
-4.744					1969.304	3.71E-06	1855.17	9.35	27	-0.08						1712.125	-0.56	-4.6	
-4.796					1969.287	3.82E-06	1855.09	9.36	26.84	-0.08						1711.958	-1.6	-4.48	
-4.866					1969.269	3.76E-06	1855	9.4	26.39	-0.09						1711.791	-0.44	-4.69	
-4.925					1969.252	3.72E-06	1854.92	9.41	26.27	-0.09						1711.625	-0.49	-3.88	
-4.909					1969.234	3.78E-06	1854.84	9.4	26.28	-0.1						1711.458	-0.96	-4.07	
-4.865					1969.217	3.87E-06	1854.75	9.49	25.22	-0.1						1711.291	-1.43	-4.26	
-4.799					1969.199	3.88E-06	1854.67	9.52	24.88	-0.11						1711.125	-0.65	-4.32	8.9609
-4.68					1969.182	3.95E-06	1854.59	9.47	25.47	-0.11						1710.958	0.13	-4.37	9.13313
-4.62					1969.164	4.01E-06	1854.5	9.4	26.35	-0.12						1710.791	-0.1	-3.96	9.18786

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1828.35	0.65	-5.5							1852.63
													1828.25	1.09	-5.36							1852.54
													1828.15	1	-5.31							1852.46
													1828.05	0.86	-5.5							1852.38
													1827.95	0.46	-5.67							1852.29
													1827.75	0.47	-5.85							1852.21
													1827.63	0.56	-5.8							1852.13
													1827.5	0.71	-5.78							1852.04
													1827.38	1.14	-5.19							1851.96
													1827.25	1.06	-5.1							1851.88
													1827.13	0.77	-5.21							1851.79
													1827	0.53	-5.38							1851.71
													1826.75	0.23	-5.8							1851.63
													1826.67	0.45	-5.6							1851.54
													1826.58	0.47	-5.67							1851.46
													1826.5	0.77	-5.59							1851.38
													1826.42	0.71	-5.58							1851.29
													1826.33	0.65	-5.51							1851.21
													1826.25	0.52	-5.34							1851.13
													1826.17	0.65	-5.36							1851.04
													1826.08	0.56	-5.43							1850.96
													1826	0.58	-5.57							1850.88
													1825.92	0.46	-5.78							1850.79
													1825.75	0.63	-5.86							1850.71
													1825.66	0.53	-5.81							1850.63
													1825.57	0.23	-5.79							1850.54
													1825.48	0.65	-5.7							1850.46
													1825.39	0.55	-5.52							1850.38
													1825.3	0.99	-5.36							1850.29
													1825.2	0.96	-5.37							1850.21
													1825.11	0.45	-5.43							1850.13
													1825.02	0.79	-5.57							1850.04
													1824.93	-0.14	-6.16							1849.96
													1824.75	0.3	-6.23							1849.88
													1824.66	0.58	-6							1849.79
													1824.57	0.52	-5.93							1849.71
													1824.48	0.68	-5.41							1849.63
													1824.39	0.94	-5.16							1849.54
													1824.3	0.8	-5.02							1849.46
													1824.2	0.53	-5.23							1849.38
													1824.11	0.31	-5.64							1849.29
													1824.02	0.11	-5.87							1849.21
													1823.93	0.12	-5.83							1849.13
													1823.75	0.12	-5.94							1849.04
													1823.64	0.18	-5.93							1848.96

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
-4.453					1969.146	3.88E-06	1854.42	9.33	27.19	-0.13						1710.625	-0.33	-3.55	9.31544
-4.252					1969.129	3.87E-06	1854.34	9.33	27.19	-0.14						1710.458	-0.7	-3.92	9.17232
-4.514					1969.111	3.85E-06	1854.25	9.36	26.82	-0.15						1710.291	-0.47	-4.3	9.09458
-4.7					1969.094	3.82E-06	1854.17	9.36	26.86	-0.16						1710.125	0.37	-4.67	9.05413
-4.947					1969.076	3.79E-06	1854.09	9.38	26.61	-0.17						1709.958	0.04	-4.48	9.18658
-4.91					1969.059	3.72E-06	1854	9.47	25.54	-0.19						1709.791	-0.14	-4.18	9.36894
-4.892					1969.041	3.72E-06	1853.92	9.5	25.09	-0.2						1709.625	-0.16	-3.77	9.39904
-4.556					1969.024	3.79E-06	1853.84	9.53	24.77	-0.21						1709.458	-0.22	-4.1	9.23035
-4.806					1969.006	0.000004	1853.75	9.55	24.46	-0.23						1709.291	-0.26	-4.51	9.0801
-4.771					1968.989	3.93E-06	1853.67	9.56	24.37	-0.24						1709.125	-0.28	-4.98	9.02598
-4.72					1968.971	3.97E-06	1853.59	9.57	24.29	-0.25						1708.958	-0.1	-4.77	9.07539
-4.646					1968.954	3.77E-06	1853.5	9.52	24.83	-0.27						1708.791	-0.17	-4.5	9.35278
-4.66					1968.936	3.81E-06	1853.42	9.46	25.61	-0.28						1708.625	-0.49	-4.16	9.47012
-4.653					1968.918	3.83E-06	1853.34	9.43	26.01	-0.3						1708.458	-0.2	-4.32	9.26694
-4.699					1968.901	3.73E-06	1853.25	9.42	26.14	-0.31						1708.291	0.14	-4.56	9.06577
-4.952					1968.883	3.88E-06	1853.17	9.4	26.36	-0.33						1708.125	0.52	-4.89	8.984
-5.07					1968.866	4.11E-06	1853.09	9.41	26.18	-0.34						1707.958	0.05	-4.6	9.03114
-5.068					1968.848	4.16E-06	1853	9.45	25.75	-0.36						1707.791	-0.12	-4.19	9.23063
-4.981					1968.831	4.01E-06	1852.92	9.5	25.11	-0.38						1707.625	0.02	-3.67	9.42178
-5.016					1968.813	3.91E-06	1852.84	9.58	24.1	-0.39						1707.458	-0.11	-4.1	9.22276
-4.946					1968.796	4.06E-06	1852.75	9.6	23.95	-0.41						1707.291	-0.08	-4.44	9.12247
-4.838					1968.778	3.82E-06	1852.67	9.6	23.91	-0.42						1707.125	0.1	-4.67	8.98123
-4.749					1968.761	3.87E-06	1852.59	9.53	24.78	-0.44						1706.958	0.02	-4.6	9.05526
-4.561					1968.743	3.92E-06	1852.5	9.5	25.17	-0.45						1706.791	-0.06	-4.36	9.15313
-4.536					1968.725	4.18E-06	1852.42	9.44	25.88	-0.47						1706.625	-0.15	-3.93	9.27484
-4.457					1968.708	4.1E-06	1852.34	9.36	26.85	-0.49						1706.458	-0.39	-3.98	9.12525
-4.672					1968.69	4.25E-06	1852.25	9.32	27.33	-0.5						1706.291	-0.27	-4.33	8.87369
-4.673					1968.673	4.24E-06	1852.17	9.3	27.56	-0.52						1706.125	-0.01	-4.58	8.84105
-4.713					1968.655	4.3E-06	1852.09	9.35	26.99	-0.54						1705.958	0.01	-4.47	9.02423
-4.781					1968.638	4.28E-06	1852	9.41	26.17	-0.55						1705.791	-0.32	-4.05	9.11292
-4.742					1968.62	4.19E-06	1851.92	9.47	25.53	-0.57						1705.625	-0.38	-3.86	9.1707
-4.738					1968.603	4.27E-06	1851.84	9.55	24.53	-0.59						1705.458	-0.43	-4.18	9.06566
-4.745					1968.585	4.43E-06	1851.75	9.6	23.97	-0.6						1705.291	-0.36	-4.57	8.91587
-4.653					1968.568	4.56E-06	1851.67	9.62	23.67	-0.62						1705.125	-0.15	-5.02	8.84502
-4.618					1968.55	4.76E-06	1851.59	9.53	24.76	-0.64						1704.958	-0.06	-4.57	8.91305
-4.418					1968.53	4.92E-06	1851.5	9.45	25.76	-0.65						1704.791	-0.17	-4.23	9.02218
-4.416					1968.51	4.91E-06	1851.42	9.4	26.36	-0.67						1704.625	-0.48	-3.98	9.23045
-4.405					1968.49	5.03E-06	1851.34	9.43	25.94	-0.69						1704.458	-0.72	-4.01	9.0478
-4.461					1968.47	5.05E-06	1851.25	9.48	25.41	-0.7						1704.291	-0.52	-4.55	8.86656
-4.609					1968.45	5.11E-06	1851.17	9.51	25.02	-0.72						1704.125	-0.37	-4.91	8.7976
-4.735					1968.43	5.08E-06	1851.09	9.53	24.79	-0.73						1703.958	-0.31	-4.81	8.88058
-4.799					1968.41	5.38E-06	1851	9.53	24.71	-0.74						1703.791	-0.28	-4.35	9.07689
-4.778					1968.39	5.48E-06	1850.92	9.54	24.69	-0.75						1703.625	-0.4	-3.95	9.24407
-4.677					1968.37	5.36E-06	1850.84	9.59	24.03	-0.77						1703.458	-0.48	-3.96	9.11565
-4.678					1968.35	5.32E-06	1850.75	9.59	23.99	-0.78						1703.291	-0.22	-4.37	8.98461

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1823.53	0.57	-5.93							1848.88
													1823.42	0.67	-5.45							1848.79
													1823.31	0.96	-5.32							1848.71
													1823.19	0.52	-5.37							1848.63
													1823.08	0.45	-5.62							1848.54
													1822.97	-0.06	-6.01							1848.46
													1822.75	-0.17	-6.01							1848.38
													1822.67	0.2	-5.96							1848.29
													1822.58	0.03	-5.74							1848.21
													1822.5	0.69	-5.5							1848.13
													1822.42	0.96	-5.52							1848.04
													1822.33	0.78	-5.32							1847.96
													1822.25	0.43	-5.22							1847.88
													1822.17	0.24	-5.49							1847.79
													1822.08	0.21	-6.03							1847.71
													1822	-0.21	-6.16							1847.63
													1821.92	-0.36	-6.32							1847.54
													1821.75	-0.56	-6.36							1847.46
													1821.64	0.32	-6.23							1847.38
													1821.53	0.69	-5.71							1847.29
													1821.42	0.96	-5.22							1847.21
													1821.31	1.03	-5.27							1847.13
													1821.19	0.47	-5.46							1847.04
													1821.08	-0.39	-6.03							1846.96
													1820.97	-0.66	-6.08							1846.88
													1820.75	-0.26	-6.23							1846.79
													1820.65	0.2	-6.12							1846.71
													1820.55	0.62	-5.73							1846.63
													1820.45	0.61	-5.34							1846.54
													1820.35	0.56	-5.28							
													1820.25	0.49	-5.51							
													1820.15	0.67	-5.69							
													1820.05	0.26	-5.82							
													1819.95	0.02	-5.71							
													1819.75	-0.22	-5.86							
													1819.61	0.25	-5.73							
													1819.46	0.33	-5.39							
													1819.32	0.54	-5.18							
													1819.18	0.65	-5.21							
													1819.04	0.5	-5.56							
													1818.75	0.01	-6.16							
													1818.67	0.03	-5.9							
													1818.58	0.08	-5.91							
													1818.5	0.86	-5.71							
													1818.42	0.64	-5.43							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
-4.579					1968.33	6.44E-06	1850.67	9.64	23.42	-0.79						1703.125	0.04	-4.57	8.96617
-4.471					1968.31	8.31E-06	1850.59	9.67	23.06	-0.8						1702.958	0.07	-4.41	9.0133
-4.438					1968.29	1.01E-05	1850.5	9.55	24.55	-0.8						1702.791	-0.06	-4.03	9.1744
-4.421					1968.27	1.26E-05	1850.42	9.4	26.34	-0.81						1702.625	0.09	-3.65	9.25446
-4.345					1968.25	1.14E-05	1850.34	9.41	26.21	-0.82						1702.458	-0.3	-3.8	9.18538
-4.444					1968.23	9.04E-06	1850.25	9.39	26.44	-0.82						1702.291	0.24	-4.44	9.00493
-4.507					1968.21	8.17E-06	1850.17	9.49	25.19	-0.83						1702.125	0.34	-4.79	8.97631
-4.763					1968.19	7.19E-06	1850.09	9.55	24.57	-0.83						1701.958	0.08	-4.63	9.10644
-4.795					1968.17	6.59E-06	1850	9.58	24.1	-0.83						1701.791	-0.05	-4.15	9.14227
-4.771					1968.15	4.58E-06	1849.92	9.6	23.93	-0.84						1701.625	-0.31	-3.78	9.28156
-4.746					1968.13	4.17E-06	1849.84	9.61	23.82	-0.84						1701.458	-0.59	-4.23	9.26191
-4.628					1968.11	4.1E-06	1849.75	9.59	24	-0.84						1701.291	0.05	-4.57	9.1095
-4.554					1968.09	3.81E-06	1849.67	9.62	23.67	-0.84						1701.125	0.04	-4.48	9.00687
-4.463					1968.07	4.19E-06	1849.59	9.6	23.85	-0.84						1700.958	-0.56	-4.27	9.09229
-4.426					1968.05	4.08E-06	1849.5	9.49	25.22	-0.84						1700.791	-1.2	-3.87	9.11794
-4.352					1968.03	4.04E-06	1849.42	9.5	25.16	-0.83						1700.625	-2.75	-3.81	9.2973
-4.315					1968.01	3.97E-06	1849.34	9.45	25.68	-0.83						1700.458	-2.76	-4.28	9.1275
-4.477					1967.99	3.9E-06	1849.25	9.42	26.13	-0.83						1700.291	-2.36	-4.59	9.12855
-4.72					1967.97	3.92E-06	1849.17	9.4	26.37	-0.83						1700.125	-1.54	-4.74	9.00331
-4.948					1967.95	3.82E-06	1849.09	9.42	26.13	-0.82						1699.958	-1.1	-4.24	9.05792
-4.779					1967.93	3.99E-06	1849	9.46	25.63	-0.82						1699.791	-1.31	-3.91	9.17986
-4.837					1967.91	4.04E-06	1848.92	9.48	25.33	-0.82						1699.625	-2.17	-3.74	9.30677
-4.804					1967.89	4.02E-06	1848.84	9.55	24.52	-0.82						1699.458	-1.86	-4.15	9.1446
-4.704					1967.87	4.01E-06	1848.75	9.56	24.35	-0.81						1699.291	-1.54	-4.55	9.08456
-4.767					1967.85	3.66E-06	1848.67	9.57	24.27	-0.81						1699.125	-1.15	-4.42	8.97269
-4.751					1967.83	3.69E-06	1848.59	9.54	24.61	-0.81						1698.958	-0.76	-4.28	9.13651
-4.685					1967.81	3.95E-06	1848.5	9.5	25.07	-0.81						1698.791	-1.55	-4.12	9.23783
-4.581					1967.79	3.56E-06	1848.42	9.47	25.53	-0.8						1698.625	-2.34	-3.96	9.27666
-4.483					1967.77	3.54E-06	1848.34	9.45	25.7	-0.8						1698.458	-2.18	-4.22	9.15935
					1967.75	3.62E-06	1848.25	9.36	26.84	-0.8						1698.291	-2.01	-4.47	9.00313
					1967.73	3.78E-06	1848.17	9.34	27.07	-0.8						1698.125	-1.8	-4.61	8.93064
					1967.71	3.8E-06	1848.09	9.4	26.33	-0.8						1697.958	-1.58	-4.74	9.07893
					1967.69	3.85E-06	1848	9.46	25.64	-0.8						1697.791	-1.44	-4.23	9.22721
					1967.67	3.98E-06	1847.92	9.46	25.66	-0.8						1697.625	-1.29	-3.72	9.3755
					1967.65	3.94E-06	1847.84	9.52	24.87	-0.8						1697.458	-1.43	-4.14	9.18011
					1967.63	4.01E-06	1847.75	9.62	23.63	-0.8						1697.291	-1.57	-4.56	9.02873
					1967.61	3.96E-06	1847.67	9.61	23.79	-0.8						1697.125	-1.07	-4.51	8.93085
					1967.59	3.77E-06	1847.59	9.59	24.05	-0.8						1696.958	-0.57	-4.45	9.02644
					1967.57	3.74E-06	1847.5	9.56	24.44	-0.8						1696.791	-0.81	-4.1	9.17125
					1967.55	4.07E-06	1847.42	9.5	25.06	-0.8						1696.625	-1.05	-3.75	9.30337
					1967.535	3.96E-06	1847.34	9.45	25.72	-0.8						1696.458	-1.16	-3.91	9.22398
					1967.519	3.94E-06	1847.25	9.43	25.98	-0.8						1696.291	-0.77	-3.96	9.11262
					1967.504	4.12E-06	1847.17	9.45	25.73	-0.8						1696.125	0.12	-3.9	8.9693
					1967.488	4.31E-06	1847.09	9.47	25.54	-0.8						1695.958	-0.01	-4.11	8.99923
					1967.473	4.14E-06	1847	9.5	25.13	-0.8						1695.791	-0.21	-3.98	9.10027

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1818.33	0.58	-5.43							
													1818.25	0.51	-5.53							
													1818.17	0.31	-5.78							
													1818.08	0.35	-5.8							
													1818	-0.07	-6.21							
													1817.92	-0.23	-6.12							
													1817.75	0.07	-6.24							
													1817.63	0.16	-5.77							
													1817.5	0.65	-5.24							
													1817.38	0.81	-5.03							
													1817.25	0.62	-5.3							
													1817.13	0.51	-5.51							
													1817	0.3	-5.72							
													1816.75	0.46	-5.76							
													1816.64	0.37	-5.68							
													1816.53	0.37	-5.23							
													1816.42	0.8	-5.1							
													1816.31	0.61	-5.3							
													1816.19	0.07	-5.6							
													1816.08	0.16	-5.97							
													1815.97	-0.06	-6.35							
													1815.75	-0.33	-6.21							
													1815.67	0.24	-6.07							
													1815.58	0.08	-5.97							
													1815.5	0.7	-5.59							
													1815.42	0.73	-5.38							
													1815.33	0.75	-5.26							
													1815.25	0.55	-5.5							
													1815.17	0.71	-5.29							
													1815.08	0.51	-5.25							
													1815	-0.09	-5.57							
													1814.92	0.73	-6.04							
													1814.75	0.32	-6.2							
													1814.66	-0.61	-5.88							
													1814.57	-0.6	-6.29							
													1814.48	0.28	-5.83							
													1814.39	0.35	-5.29							
													1814.3	0.4	-5.11							
													1814.2	0.65	-5.09							
													1814.11	0.86	-5.34							
													1814.02	0.53	-5.67							
													1813.93	0.33	-6.01							
													1813.75	-0.08	-6.18							
													1813.65	0.34	-6.09							
													1813.55	0.47	-5.86							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1967.458	4.24E-06	1846.92	9.54	24.64	-0.79						1695.625	-0.46	-3.5	9.25439
					1967.442	4.38E-06	1846.84	9.57	24.29	-0.79						1695.458	-0.79	-4.08	9.11473
					1967.427	4.14E-06	1846.75	9.62	23.71	-0.79						1695.291	-0.77	-4.56	9.01137
					1967.412	4.3E-06	1846.67	9.58	24.15	-0.79						1695.125	-0.42	-4.95	8.86246
					1967.396	4.58E-06	1846.59	9.63	23.6	-0.79						1694.958	-0.4	-4.74	8.93939
					1967.381	4.23E-06	1846.5	9.51	24.97	-0.79						1694.791	-0.33	-4.43	9.06475
					1967.365	4.07E-06	1846.42	9.42	26.05	-0.79						1694.625	-0.2	-4.02	9.18844
					1967.35	4.02E-06	1846.34	9.36	26.79	-0.79						1694.458	-0.56	-4.33	9.11762
					1967.335	4.17E-06	1846.25	9.37	26.75	-0.78						1694.291	-0.92	-4.63	8.92359
					1967.319	4.18E-06	1846.17	9.37	26.72	-0.78						1694.125	-0.48	-4.56	8.88778
					1967.304	4.74E-06	1846.09	9.39	26.5	-0.78						1693.958	-0.04	-4.49	8.92698
					1967.288	5.54E-06	1846	9.44	25.8	-0.78						1693.791	-0.07	-4.07	9.06794
					1967.273	5.83E-06	1845.92	9.51	24.98	-0.77						1693.625	-0.1	-3.64	9.20313
					1967.258	5.34E-06	1845.84	9.58	24.15	-0.77						1693.458	-0.37	-4.01	9.17431
					1967.242	5.4E-06	1845.75	9.62	23.67	-0.77						1693.291	-1.35	-3.97	9.00445
					1967.227	5.1E-06	1845.67	9.64	23.46	-0.76						1693.125	-0.44	-4.71	8.90734
					1967.212	4.94E-06	1845.59	9.64	23.44	-0.76						1692.958	0.09	-4.84	8.99863
					1967.196	4.67E-06	1845.5	9.54	24.61	-0.75						1692.791	-0.24	-4.19	9.03953
					1967.181	4.49E-06	1845.42	9.53	24.72	-0.75						1692.625	-1.57	-3.99	9.20643
					1967.165	4.22E-06	1845.34	9.49	25.25	-0.74						1692.458	-1.95	-4.11	9.18196
					1967.15	4.04E-06	1845.25	9.4	26.32	-0.73						1692.291	-1.73	-4.4	9.06453
					1967.135	3.9E-06	1845.17	9.45	25.79	-0.72						1692.125	-0.98	-4.65	8.90727
					1967.119	3.76E-06	1845.09	9.49	25.29	-0.71						1691.958	-0.42	-4.61	8.90732
					1967.104	3.78E-06	1845	9.48	25.4	-0.7						1691.791	-0.49	-4.17	8.9943
					1967.088	3.76E-06	1844.92	9.49	25.25	-0.69						1691.625	-0.18	-3.55	9.16819
					1967.073	3.88E-06	1844.84	9.57	24.31	-0.68						1691.458	-0.25	-4.54	9.12159
					1967.058	3.79E-06	1844.75	9.61	23.74	-0.67						1691.291	-0.25	-4.96	8.99727
					1967.042	3.84E-06	1844.67	9.66	23.18	-0.66						1691.125	-0.19	-4.83	8.86676
					1967.027	3.95E-06	1844.59	9.62	23.67	-0.64						1690.958	0.04	-4.4	8.95158
					1967.012	0.000004	1844.5	9.61	23.79	-0.63						1690.791	-0.19	-4.12	9.14789
					1966.996	3.84E-06	1844.42	9.59	24.06	-0.62						1690.625	-0.88	-3.97	9.24662
					1966.981	3.98E-06	1844.34	9.48	25.31	-0.6						1690.458	-0.43	-4.43	9.16191
					1966.965	3.8E-06	1844.25	9.35	26.99	-0.59						1690.291	0.02	-4.89	8.99132
					1966.95	3.86E-06	1844.17	9.28	27.76	-0.57						1690.125	-0.07	-4.71	8.95468
					1966.935	3.77E-06	1844.09	9.33	27.18	-0.55						1689.958	-0.15	-4.52	9.06968
					1966.919	3.74E-06	1844	9.41	26.2	-0.54						1689.791	-0.17	-4.18	9.13926
					1966.904	3.87E-06	1843.92	9.5	25.09	-0.52						1689.625	-0.18	-3.84	9.30543
					1966.888	4.02E-06	1843.84	9.57	24.22	-0.51						1689.458	-0.15	-4.32	9.07674
					1966.873	4.32E-06	1843.75	9.59	24.03	-0.49						1689.291	-0.12	-4.78	8.97416
					1966.858	4.32E-06	1843.67	9.54	24.64	-0.47						1689.125	0.03	-4.68	8.91808
					1966.842	4.36E-06	1843.59	9.52	24.9	-0.46						1688.958	0.04	-4.35	9.02653
					1966.827	4.32E-06	1843.5	9.5	25.17	-0.44						1688.791	-0.34	-4.24	9.17259
					1966.812	4.18E-06	1843.42	9.47	25.52	-0.43						1688.625	-1.03	-4.04	9.33895
					1966.796	4.16E-06	1843.34	9.42	26.13	-0.41						1688.458	-0.62	-4.32	
					1966.781	4.1E-06	1843.25	9.37	26.75	-0.39						1688.291	-0.34	-4.61	

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1813.45	0.41	-5.73							
													1813.35	0.24	-5.49							
													1813.25	0.14	-5.71							
													1813.15	-0.07	-6.06							
													1813.05	0.28	-6.02							
													1812.95	0.05	-6.1							
													1812.75	-0.14	-6.2							
													1812.63	-0.27	-5.94							
													1812.5	-0.39	-5.89							
													1812.38	-0.04	-5.79							
													1812.25	-0.22	-5.74							
													1812.13	0.05	-5.75							
													1812	0.1	-6.28							
													1811.75	0.09	-6.31							
													1811.66	-0.01	-6.27							
													1811.57	-0.28	-5.83							
													1811.48	0.21	-5.99							
													1811.39	0.26	-5.94							
													1811.3	0.45	-5.42							
													1811.2	0.44	-5.45							
													1811.11	0.2	-5.5							
													1811.02	-0.08	-5.65							
													1810.93	-0.33	-5.8							
													1810.75	-0.53	-5.93							
													1810.67	-0.93	-5.87							
													1810.6	-1.15	-5.84							
													1810.52	-0.86	-5.89							
													1810.44	-0.5	-5.95							
													1810.37	-0.05	-5.57							
													1810.29	0.55	-5.41							
													1810.21	0.45	-5.35							
													1810.13	0.13	-5.63							
													1810.06	0.4	-6.09							
													1809.98	-0.3	-6.23							
													1809.9	-1.01	-6.34							
													1809.75	-0.23	-6.41							
													1809.64	-0.27	-6.29							
													1809.53	0.05	-5.94							
													1809.42	0.42	-5.5							
													1809.31	0.46	-5.16							
													1809.19	0.39	-5.83							
													1809.08	-0.16	-6.3							
													1808.97	-0.46	-6.63							
													1808.75	-0.49	-6.59							
													1808.66	-0.71	-6.43							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1966.765	4.02E-06	1843.17	9.34	27.07	-0.38						1688.125	-0.2	-4.9	
					1966.75	3.89E-06	1843.09	9.4	26.39	-0.36						1687.958	-0.17	-4.33	
					1966.735	3.8E-06	1843	9.4	26.32	-0.35						1687.791	-0.2	-3.94	
					1966.719	3.84E-06	1842.92	9.46	25.61	-0.34						1687.625	-0.31	-3.74	
					1966.704	3.85E-06	1842.84	9.56	24.39	-0.32						1687.458	-0.19	-4.09	
					1966.688	3.97E-06	1842.75	9.61	23.79	-0.31						1687.291	-0.07	-4.43	
					1966.673	4.11E-06	1842.67	9.58	24.15	-0.3						1687.125	0.05	-4.77	
					1966.658	4.22E-06	1842.59	9.53	24.8	-0.28						1686.958	-0.04	-4.5	
					1966.642	4.22E-06	1842.5	9.38	26.6	-0.27						1686.791	-0.12	-4.22	
					1966.627	4.18E-06	1842.42	9.39	26.41	-0.26						1686.625	-0.21	-3.95	
					1966.612	4.28E-06	1842.34	9.36	26.85	-0.25						1686.458	-0.13	-4.75	
					1966.596	4.09E-06	1842.25	9.34	27.07	-0.24						1686.291	-0.34	-4.72	
					1966.581	4.1E-06	1842.17	9.44	25.8	-0.23						1686.125	-0.34	-4.73	
					1966.565	4.19E-06	1842.09	9.52	24.93	-0.22						1685.958	-0.17	-4.61	
					1966.55	4.32E-06	1842	9.55	24.57	-0.21						1685.791	-0.19	-4.1	
					1966.534	4.27E-06	1841.92	9.55	24.47	-0.2						1685.625	-0.71	-3.62	
					1966.518	4.29E-06	1841.84	9.53	24.75	-0.19						1685.458	-0.48	-3.85	
					1966.502	4.47E-06	1841.75	9.53	24.71	-0.18						1685.291	-0.24	-4.07	
					1966.485	4.48E-06	1841.67	9.56	24.4	-0.18						1685.125	-0.01	-4.29	
					1966.469	4.7E-06	1841.59	9.47	25.51	-0.17						1684.958	-0.23	-4.19	
					1966.453	4.92E-06	1841.5	9.43	26	-0.17						1684.791	-0.46	-4.09	
					1966.437	4.9E-06	1841.42	9.38	26.58	-0.16						1684.625	-0.7	-3.98	
					1966.421	4.85E-06	1841.34	9.28	27.78	-0.16						1684.458	-0.49	-4.2	
					1966.405	4.8E-06	1841.25	9.26	27.99	-0.16						1684.291	-0.23	-4.42	
					1966.389	4.8E-06	1841.17	9.27	27.87	-0.16						1684.125	0.07	-4.63	
					1966.373	4.75E-06	1841.09	9.3	27.53	-0.16						1683.958	-0.02	-4.42	
					1966.356	4.68E-06	1841	9.36	26.85	-0.16						1683.791	-0.23	-4.2	
					1966.34	4.57E-06	1840.92	9.42	26.12	-0.16						1683.625	-0.58	-3.98	
					1966.324	4.43E-06	1840.84	9.5	25.13	-0.16						1683.458	-0.61	-4.37	
					1966.308	4.44E-06	1840.75	9.61	23.77	-0.16						1683.291	-0.48	-4.69	
					1966.292	4.34E-06	1840.67	9.63	23.55	-0.17						1683.125	-0.22	-4.69	
					1966.276	4.58E-06	1840.59	9.58	24.15	-0.17						1682.958	-0.11	-4.45	
					1966.26	4.47E-06	1840.5	9.57	24.22	-0.18						1682.791	-0.35	-4.16	
					1966.244	4.42E-06	1840.42	9.49	25.25	-0.19						1682.625	-0.65	-3.79	
					1966.227	4.27E-06	1840.34	9.38	26.55	-0.19						1682.458	-0.52	-4.28	
					1966.211	4.37E-06	1840.25	9.32	27.25	-0.2						1682.291	-0.38	-4.72	
					1966.195	4.55E-06	1840.17	9.3	27.61	-0.21						1682.125	-0.22	-5.13	
					1966.179	4.37E-06	1840.09	9.31	27.41	-0.22						1681.958	-0.15	-4.75	
					1966.163	4.52E-06	1840	9.36	26.84	-0.23						1681.791	-0.11	-4.35	
					1966.147	4.46E-06	1839.92	9.4	26.39	-0.24						1681.625	-0.1	-3.92	
					1966.131	4.87E-06	1839.84	9.46	25.64	-0.25						1681.458	-0.56	-4.05	
					1966.115	4.52E-06	1839.75	9.5	25.08	-0.26						1681.291	-0.38	-4.52	
					1966.098	4.55E-06	1839.67	9.55	24.52	-0.27						1681.125	-0.11	-4.82	
					1966.082	4.23E-06	1839.59	9.55	24.49	-0.28						1680.958	-0.02	-4.75	
					1966.066	4.15E-06	1839.5	9.52	24.92	-0.29						1680.791	-0.12	-4.38	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1808.57	-0.14	-6.19							
													1808.48	0.23	-6.02							
													1808.39	-0.21	-5.62							
													1808.3	-0.08	-5.72							
													1808.2	-0.19	-5.79							
													1808.11	-0.07	-5.76							
													1808.02	0.17	-6.14							
													1807.93	-0.53	-6.43							
													1807.75	-0.49	-6.44							
													1807.66	-0.47	-6.21							
													1807.57	-0.2	-6.24							
													1807.48	-0.56	-6.03							
													1807.39	-0.24	-5.79							
													1807.3	0.1	-5.52							
													1807.2	0.09	-5.55							
													1807.11	-0.07	-5.67							
													1807.02	-0.3	-5.69							
													1806.93	-0.47	-6.09							
													1806.75	-0.53	-6.38							
													1806.67	-0.94	-6.2							
													1806.6	-0.51	-5.93							
													1806.52	-0.24	-5.95							
													1806.44	0.26	-5.89							
													1806.37	-0.04	-5.56							
													1806.29	0.14	-5.44							
													1806.21	-0.06	-5.51							
													1806.13	-0.23	-5.67							
													1806.06	-0.11	-5.79							
													1805.98	0.2	-6.04							
													1805.9	-0.09	-6.33							
													1805.75	-1.04	-6.42							
													1805.67	-0.99	-6.28							
													1805.6	-0.18	-6.04							
													1805.52	-0.14	-6.01							
													1805.44	0.12	-5.85							
													1805.37	0.57	-5.6							
													1805.29	0.13	-5.49							
													1805.21	-0.1	-5.41							
													1805.13	0.01	-5.74							
													1805.06	-0.24	-5.9							
													1804.98	-0.26	-6.11							
													1804.9	0.05	-6.14							
													1804.75	-0.12	-6.13							
													1804.67	-0.43	-6.01							
													1804.58	-0.3	-6.03							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1966.05	4.17E-06	1839.42	9.47	25.45	-0.3						1680.625	-0.15	-3.95	
					1966.034	4.27E-06	1839.34	9.4	26.36	-0.31						1680.458	-0.58	-4.23	
					1966.018	4.2E-06	1839.25	9.35	26.96	-0.33						1680.291	-0.4	-4.76	
					1966.002	4.05E-06	1839.17	9.36	26.79	-0.34						1680.125	-0.23	-4.99	
					1965.985	4.06E-06	1839.09	9.41	26.21	-0.35						1679.958	-0.16	-4.84	
					1965.969	3.92E-06	1839	9.46	25.6	-0.36						1679.791	-0.12	-4.42	
					1965.953	4.05E-06	1838.92	9.51	24.95	-0.37						1679.625	-0.14	-3.75	
					1965.937	4.01E-06	1838.84	9.57	24.23	-0.38						1679.458	-0.27	-4.23	
					1965.921	3.83E-06	1838.75	9.6	23.95	-0.39						1679.291	-0.13	-4.65	
					1965.905	3.83E-06	1838.67	9.59	24.03	-0.4						1679.125	0.28	-5	
					1965.889	3.82E-06	1838.59	9.52	24.87	-0.4						1678.958	0.23	-4.87	
					1965.873	3.85E-06	1838.5	9.55	24.51	-0.41						1678.791	0.17	-4.54	
					1965.856	3.93E-06	1838.42	9.54	24.64	-0.41						1678.625	0.08	-4	
					1965.84	3.82E-06	1838.34	9.47	25.51	-0.42						1678.458	-0.1	-4.12	
					1965.824	3.89E-06	1838.25	9.43	25.99	-0.42						1678.291	0.08	-4.57	
					1965.808	3.92E-06	1838.17	9.4	26.38	-0.42						1678.125	0.06	-4.76	
					1965.792	3.96E-06	1838.09	9.38	26.54	-0.43						1677.958	-0.13	-4.57	
					1965.776	3.99E-06	1838	9.43	25.96	-0.43						1677.791	-0.29	-4.23	
					1965.76	3.93E-06	1837.92	9.54	24.63	-0.43						1677.625	-0.61	-4.09	
					1965.744	4.07E-06	1837.84	9.59	24.01	-0.42						1677.458	-0.43	-4.48	
					1965.727	4.03E-06	1837.75	9.66	23.22	-0.42						1677.291	-0.23	-4.86	
					1965.711	3.95E-06	1837.67	9.62	23.67	-0.42						1677.125	-0.14	-4.85	
					1965.695	3.84E-06	1837.59	9.59	24	-0.41						1676.958	-0.19	-4.57	
					1965.679	3.88E-06	1837.5	9.57	24.31	-0.41						1676.791	-0.36	-4.31	
					1965.663	3.95E-06	1837.42	9.53	24.7	-0.4						1676.625	-0.46	-4.18	
					1965.647	3.87E-06	1837.34	9.47	25.46	-0.39						1676.458	-0.57	-4.59	
					1965.631	3.83E-06	1837.25	9.39	26.49	-0.38						1676.291	-0.63	-4.78	
					1965.615	3.84E-06	1837.17	9.35	26.99	-0.37						1676.125	-0.66	-4.74	
					1965.598	3.96E-06	1837.09	9.35	26.93	-0.36						1675.958	-0.51	-4.43	
					1965.582	4.11E-06	1837	9.36	26.87	-0.35						1675.791	-0.45	-4.11	
					1965.566	4.17E-06	1836.92	9.44	25.89	-0.34						1675.625	-0.49	-3.78	
					1965.55	4.36E-06	1836.84	9.51	24.96	-0.33						1675.458	-0.71	-4.26	
					1965.535	4.43E-06	1836.75	9.51	25.04	-0.32						1675.291	-0.58	-4.68	
					1965.519	4.32E-06	1836.67	9.56	24.4	-0.31						1675.125	-0.58	-4.79	
					1965.504	4.34E-06	1836.59	9.48	25.41	-0.3						1674.958	-0.55	-4.58	
					1965.488	4.23E-06	1836.5	9.38	26.54	-0.28						1674.791	-0.38	-4.19	
					1965.473	4.07E-06	1836.42	9.45	25.76	-0.27						1674.625	-0.57	-3.89	
					1965.458	3.99E-06	1836.34	9.54	24.68	-0.26						1674.458	-0.5	-4.32	
					1965.442	3.99E-06	1836.25	9.58	24.2	-0.24						1674.291	-0.34	-4.72	
					1965.427	3.95E-06	1836.17	9.6	23.97	-0.23						1674.125	-0.25	-4.71	
					1965.412	3.98E-06	1836.09	9.58	24.17	-0.22						1673.958	-0.21	-4.44	
					1965.396	0.000004	1836	9.55	24.5	-0.2						1673.791	-0.19	-4.19	
					1965.381	4.22E-06	1835.92	9.52	24.84	-0.19						1673.625	-0.29	-3.98	
					1965.365	4.29E-06	1835.84	9.47	25.5	-0.18						1673.458	-0.93	-4.14	
					1965.35	4.49E-06	1835.75	9.41	26.19	-0.17						1673.291	-0.4	-4.35	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1804.5	-0.02	-5.65							
													1804.42	-0.24	-5.82							
													1804.33	-0.02	-5.13							
													1804.25	-0.24	-5.57							
													1804.17	-0.01	-5.59							
													1804.08	-0.06	-5.32							
													1804	-0.63	-5.83							
													1803.92	-0.48	-5.96							
													1803.75	-0.98	-5.98							
													1803.66	0.19	-5.76							
													1803.57	0.03	-5.75							
													1803.48	-0.31	-5.76							
													1803.39	0.23	-5.49							
													1803.3	-0.26	-5.3							
													1803.2	0.07	-5.13							
													1803.11	-0.5	-5.37							
													1803.02	-0.65	-5.66							
													1802.93	-1.19	-6.04							
													1802.75	-1.41	-6.38							
													1802.67	-1.22	-6.26							
													1802.6	-0.54	-6.07							
													1802.52	-0.83	-6.22							
													1802.44	-0.69	-6.27							
													1802.37	-0.34	-5.87							
													1802.29	0.05	-5.71							
													1802.21	-0.04	-5.9							
													1802.13	-0.19	-6.1							
													1802.06	-0.96	-6.22							
													1801.98	-1.07	-6.6							
													1801.9	-1.42	-6.63							
													1801.75	-1.42	-6.55							
													1801.68	-1.24	-6.35							
													1801.61	-0.57	-6.4							
													1801.54	0.62	-6.18							
													1801.46	-0.62	-5.89							
													1801.39	-0.11	-5.63							
													1801.32	-0.29	-5.67							
													1801.25	0.02	-5.75							
													1801.18	-0.08	-5.84							
													1801.11	0.46	-5.87							
													1801.04	-0.34	-6.43							
													1800.96	-1.28	-6.55							
													1800.89	-1.39	-6.53							
													1800.75	-1.22	-6.63							
													1800.67	-1.32	-6.28							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1965.335	4.97E-06	1835.67	9.36	26.87	-0.15						1673.125	-0.35	-4.75	
					1965.319	5.45E-06	1835.59	9.32	27.32	-0.14						1672.958	-0.47	-4.64	
					1965.304	5.57E-06	1835.5	9.3	27.59	-0.13						1672.791	-0.57	-4.25	
					1965.288	5.12E-06	1835.42	9.29	27.67	-0.13						1672.625	-1.23	-3.86	
					1965.273	5.05E-06	1835.34	9.3	27.53	-0.12						1672.458	-1.32	-4.19	
					1965.258	4.75E-06	1835.25	9.31	27.43	-0.11						1672.291	-0.51	-4.46	
					1965.242	4.72E-06	1835.17	9.31	27.43	-0.11						1672.125	-0.26	-4.74	
					1965.227	4.63E-06	1835.09	9.4	26.31	-0.1						1671.958	-0.47	-4.75	
					1965.212	4.31E-06	1835	9.39	26.5	-0.1						1671.791	-0.62	-4.35	
					1965.196	4.28E-06	1834.92	9.45	25.77	-0.1						1671.625	-0.8	-3.92	
					1965.181	4.17E-06	1834.84	9.47	25.44	-0.1						1671.458	-1.4	-4.06	
					1965.165	4.5E-06	1834.75	9.49	25.3	-0.1						1671.291	-0.75	-4.65	
					1965.15	4.13E-06	1834.67	9.53	24.75	-0.1						1671.125	-0.24	-5	
					1965.135	4.05E-06	1834.59	9.54	24.63	-0.11						1670.958	-0.69	-4.95	
					1965.119	4.11E-06	1834.5	9.47	25.5	-0.11						1670.791	-0.55	-4.58	
					1965.104	4.01E-06	1834.42	9.39	26.42	-0.11						1670.625	-0.68	-4.01	
					1965.088	4.45E-06	1834.34	9.3	27.5	-0.12						1670.458	-0.99	-4.45	
					1965.073	4.37E-06	1834.25	9.33	27.22	-0.13						1670.291	-0.88	-4.92	
					1965.058	4.31E-06	1834.17	9.3	27.56	-0.13						1670.125	-0.84	-5.08	
					1965.042	4.63E-06	1834.09	9.3	27.51	-0.14						1669.958	-0.73	-4.79	
					1965.027	4.71E-06	1834	9.34	27.02	-0.15						1669.791	-0.81	-4.38	
					1965.012	4.3E-06	1833.92	9.44	25.84	-0.16						1669.625	-1	-3.92	
					1964.996	3.88E-06	1833.84	9.46	25.64	-0.16						1669.458	-1.53	-4.25	
					1964.981	3.91E-06	1833.75	9.48	25.34	-0.17						1669.291	-1.34	-4.56	
					1964.965	3.87E-06	1833.67	9.57	24.27	-0.18						1669.125	-0.87	-4.65	
					1964.95	0.000004	1833.59	9.6	23.89	-0.19						1668.958	-0.41	-4.51	
					1964.935	4.3E-06	1833.5	9.53	24.74	-0.2						1668.791	-0.29	-4.26	
					1964.919	4.22E-06	1833.42	9.44	25.85	-0.2						1668.625	-0.95	-3.98	
					1964.904	4.14E-06	1833.34	9.43	26	-0.21						1668.458	-1.08	-4.4	
					1964.888	4.21E-06	1833.25	9.4	26.29	-0.21						1668.291	-0.6	-4.76	
					1964.873	4.09E-06	1833.17	9.38	26.58	-0.22						1668.125	-0.2	-4.84	
					1964.858	4.34E-06	1833.09	9.45	25.68	-0.22						1667.958	-0.06	-4.62	
					1964.842	4.09E-06	1833	9.54	24.68	-0.22						1667.791	-0.2	-4.22	
					1964.827	4.13E-06	1832.92	9.61	23.83	-0.22						1667.625	-0.77	-3.88	
					1964.812	3.95E-06	1832.84	9.68	22.97	-0.22						1667.458	-1.21	-3.98	
					1964.796	4.08E-06	1832.75	9.71	22.57	-0.22						1667.291	-0.74	-4.37	
					1964.781	4.05E-06	1832.67	9.67	23.01	-0.21						1667.125	-0.21	-4.49	
					1964.765	4.04E-06	1832.59	9.62	23.68	-0.21						1666.958	-0.06	-4.31	
					1964.75	3.9E-06	1832.5	9.57	24.23	-0.2						1666.791	-0.47	-4.02	
					1964.735	3.9E-06	1832.42	9.48	25.35	-0.19						1666.625	-1.44	-3.81	
					1964.719	3.94E-06	1832.34	9.38	26.62	-0.18						1666.458	-1.61	-4.31	
					1964.704	3.99E-06	1832.25	9.36	26.84	-0.17						1666.291	-1.1	-4.69	
					1964.688	3.97E-06	1832.17	9.35	26.95	-0.16						1666.125	-0.51	-4.81	
					1964.673	3.92E-06	1832.09	9.38	26.61	-0.15						1665.958	-0.2	-4.57	
					1964.658	4.21E-06	1832	9.43	25.93	-0.13						1665.791	-0.16	-4.09	

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1800.6	-1.28	-6.24							
													1800.52	-0.56	-6.32							
													1800.44	-0.49	-5.93							
													1800.37	-0.62	-5.41							
													1800.29	0.05	-5.32							
													1800.21	-0.12	-5.41							
													1800.13	-0.61	-5.85							
													1800.06	-0.93	-6.16							
													1799.98	-1.39	-6.34							
													1799.9	-1.31	-6.48							
													1799.75	-1.58	-6.5							
													1799.63	-1.35	-6.41							
													1799.5	-0.04	-6.2							
													1799.38	-0.09	-5.81							
													1799.25	-0.22	-5.55							
													1799	-0.16	-5.55							
													1798	0.32	-5.82							
													1797.94	0.56	-5.78							
													1797.88	0.76	-6							
													1797.75	0.29	-6.15							
													1797.63	0.52	-5.9							
													1797.5	0.94	-5.87							
													1797.38	0.88	-5.65							
													1797.25	1.61	-5.2							
													1797.13	1.89	-5.19							
													1797	1.56	-5.74							
													1796.75	0.98	-6.06							
													1796.66	0.51	-5.75							
													1796.57	0.36	-5.83							
													1796.48	0.77	-5.71							
													1796.39	1.07	-5.56							
													1796.3	0.84	-5.54							
													1796.2	0.9	-5.21							
													1796.11	1.45	-5.15							
													1796.02	1.7	-5.31							
													1795.93	1.3	-5.38							
													1795.75	0.86	-5.7							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1964.642	4.31E-06	1831.92	9.46	25.57	-0.12						1665.625	-1.07	-3.9	
					1964.627	4.12E-06	1831.84	9.52	24.84	-0.1						1665.458	-0.89	-4.37	
					1964.612	3.99E-06	1831.75	9.55	24.52	-0.08						1665.291	-0.46	-4.75	
					1964.596	4.05E-06	1831.67	9.53	24.75	-0.07						1665.125	-0.21	-4.85	
					1964.581	3.96E-06	1831.59	9.49	25.2	-0.05						1664.958	-0.13	-4.67	
					1964.565	3.89E-06	1831.5	9.44	25.88	-0.03						1664.791	-0.2	-4.32	
					1964.55	4.02E-06	1831.42	9.4	26.35	-0.01						1664.625	-0.77	-4	
					1964.534	0.000004	1831.34	9.36	26.86	0						1664.458	-1.04	-4.26	
					1964.517	3.99E-06	1831.25	9.34	27.09	0.02						1664.291	-2.54	-4.11	
					1964.501	4.02E-06	1831.17	9.32	27.31	0.04						1664.125	-0.25	-4.95	
					1964.484	4.03E-06	1831.09	9.36	26.83	0.06						1663.958	-1.25	-4.72	
					1964.468	4.15E-06	1831	9.37	26.74	0.08						1663.791	-0.64	-4.45	
					1964.452	4.19E-06	1830.92	9.45	25.79	0.1						1663.625	-1.19	-3.93	
					1964.435	4.24E-06	1830.84	9.5	25.07	0.12						1663.458	-1.36	-4.11	
					1964.419	4.3E-06	1830.75	9.54	24.69	0.13						1663.291	-0.86	-4.59	
					1964.402	4.31E-06	1830.67	9.5	25.13	0.15						1663.125	-0.76	-4.83	
					1964.386	4.24E-06	1830.59	9.45	25.69	0.17						1662.958	-0.77	-4.7	
					1964.37	4.11E-06	1830.5	9.4	26.28	0.19						1662.791	-0.56	-4.34	
					1964.353	4.15E-06	1830.42	9.34	27.1	0.2						1662.625	-0.96	-3.89	
					1964.337	4.11E-06	1830.34	9.31	27.41	0.22						1662.458	-0.95	-4.47	
					1964.32	4.06E-06	1830.25	9.3	27.53	0.23						1662.291	-0.72	-4.89	
					1964.304	0.000004	1830.17	9.3	27.55	0.25						1662.125	-0.49	-4.98	
					1964.288	4.16E-06	1830.09	9.36	26.88	0.26						1661.958	-0.3	-4.69	
					1964.271	4.5E-06	1830	9.38	26.59	0.28						1661.791	-0.32	-4.13	
					1964.255	4.48E-06	1829.92	9.48	25.37	0.29						1661.625	-1.04	-3.67	
					1964.239	4.21E-06	1829.84	9.52	24.92	0.3						1661.458	-1.46	-4.3	
					1964.222	4.08E-06	1829.75	9.56	24.42	0.31						1661.291	-0.93	-4.86	
					1964.206	3.95E-06	1829.67	9.54	24.64	0.33						1661.125	-0.54	-5.01	
					1964.189	3.88E-06	1829.59	9.52	24.86	0.34						1660.958	-0.45	-4.71	
					1964.173	3.97E-06	1829.5	9.52	24.88	0.35						1660.791	-0.47	-4.21	
					1964.157	3.79E-06	1829.42	9.44	25.85	0.36						1660.625	-0.62	-3.86	
					1964.14	3.76E-06	1829.34	9.36	26.87	0.37						1660.458	-1.3	-4.18	
					1964.124	3.88E-06	1829.25	9.31	27.41	0.38						1660.291	-0.87	-4.96	
					1964.107	3.81E-06	1829.17	9.24	28.28	0.38						1660.125	-0.75	-5.04	
					1964.091	3.96E-06	1829.09	9.28	27.83	0.39						1659.958	-0.44	-4.93	
					1964.075	4.08E-06	1829	9.3	27.61	0.4						1659.791	-0.39	-4.38	
					1964.058	3.99E-06	1828.92	9.29	27.72	0.4						1659.625	-0.99	-3.99	
					1964.042	4.08E-06	1828.84	9.35	26.93	0.4									
					1964.025	4.02E-06	1828.75	9.43	26.02	0.41									
					1964.009	3.94E-06	1828.67	9.49	25.19	0.41									
					1963.993	4.17E-06	1828.59	9.54	24.65	0.41									
					1963.976	4.13E-06	1828.5	9.51	24.99	0.41									
					1963.96	4.01E-06	1828.42	9.48	25.38	0.41									
					1963.943	4.17E-06	1828.34	9.43	26.03	0.4									
					1963.927	4.11E-06	1828.25	9.34	27.11	0.4									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1795.64	0.97	-5.6							
													1795.53	0.92	-5.32							
													1795.42	0.7	-5.15							
													1795.31	0.72	-5.15							
													1795.19	1.5	-5.17							
													1795.08	1.55	-5.67							
													1794.97	0.78	-5.64							
													1794.75	0.3	-5.63							
													1794.65	1.04	-5.51							
													1794.55	0.41	-5.29							
													1794.45	0.16	-5.22							
													1794.35	0.14	-5.28							
													1794.25	0.57	-5.4							
													1794.15	0.79	-5.52							
													1794.05	0.4	-5.82							
													1793.95	-0.15	-5.92							
													1793.75	-0.6	-6.08							
													1793.64	0.28	-5.95							
													1793.53	0.17	-5.57							
													1793.42	0.25	-5.5							
													1793.31	0.52	-5.41							
													1793.19	0.58	-5.5							
													1793.08	0.72	-5.54							
													1792.97	0.44	-5.77							
													1792.75	-0.01	-6.01							
													1792.63	0.33	-5.94							
													1792.5	0.32	-5.85							
													1792.38	0.12	-5.78							
													1792.25	0.19	-5.28							
													1792.13	0.59	-5.56							
													1792	0.88	-5.66							
													1791.75	0.36	-6.2							
													1791.64	0.26	-6.09							
													1791.53	0.68	-5.78							
													1791.42	0.73	-5.74							
													1791.31	0.84	-5.5							
													1791.19	1.05	-5.22							
													1791.08	1.24	-5.32							
													1790.97	0.99	-5.71							
													1790.75	0.09	-6.09							
													1790.64	0.3	-5.88							
													1790.53	-0.09	-5.43							
													1790.42	0.08	-5.27							
													1790.31	0.35	-5.22							
													1790.19	0.55	-5.14							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1963.911	4.09E-06	1828.17	9.29	27.68	0.4									
					1963.894	4.02E-06	1828.09	9.24	28.25	0.39									
					1963.878	4.08E-06	1828	9.3	27.51	0.38									
					1963.861	4.03E-06	1827.92	9.33	27.13	0.38									
					1963.845	4.08E-06	1827.84	9.36	26.85	0.37									
					1963.829	4.07E-06	1827.75	9.48	25.41	0.36									
					1963.812	4.03E-06	1827.67	9.49	25.19	0.35									
					1963.796	4.04E-06	1827.59	9.49	25.23	0.34									
					1963.78	4.12E-06	1827.5	9.52	24.86	0.33									
					1963.763	4.22E-06	1827.42	9.49	25.28	0.32									
					1963.747	4.09E-06	1827.34	9.41	26.26	0.31									
					1963.73	3.99E-06	1827.25	9.35	26.97	0.29									
					1963.714	4.25E-06	1827.17	9.31	27.43	0.28									
					1963.698	4.28E-06	1827.09	9.34	27.05	0.27									
					1963.681	4.27E-06	1827	9.39	26.46	0.25									
					1963.665	4.37E-06	1826.92	9.41	26.2	0.24									
					1963.648	4.3E-06	1826.84	9.46	25.66	0.22									
					1963.632	4.62E-06	1826.75	9.47	25.47	0.21									
					1963.616	4.66E-06	1826.67	9.54	24.69	0.19									
					1963.599	4.59E-06	1826.59	9.54	24.63	0.17									
					1963.583	4.73E-06	1826.5	9.53	24.76	0.16									
					1963.566	4.68E-06	1826.42	9.4	26.28	0.14									
					1963.55	4.83E-06	1826.34	9.35	26.99	0.12									
					1963.535	4.77E-06	1826.25	9.31	27.43	0.11									
					1963.52	4.52E-06	1826.17	9.27	27.92	0.09									
					1963.505	4.7E-06	1826.09	9.33	27.13	0.07									
					1963.489	4.67E-06	1826	9.41	26.23	0.05									
					1963.474	4.76E-06	1825.92	9.42	26.06	0.04									
					1963.459	4.74E-06	1825.84	9.49	25.23	0.02									
					1963.444	4.92E-06	1825.75	9.56	24.39	0									
					1963.429	4.91E-06	1825.67	9.57	24.32	-0.02									
					1963.414	5.13E-06	1825.59	9.55	24.56	-0.04									
					1963.398	5.2E-06	1825.5	9.53	24.78	-0.06									
					1963.383	5.37E-06	1825.42	9.48	25.31	-0.07									
					1963.368	5.43E-06	1825.34	9.42	26.14	-0.09									
					1963.353	5.4E-06	1825.25	9.34	27.11	-0.11									
					1963.338	5.61E-06	1825.17	9.29	27.68	-0.13									
					1963.323	5.82E-06	1825.09	9.3	27.58	-0.14									
					1963.308	5.99E-06	1825	9.33	27.23	-0.16									
					1963.292	6.05E-06	1824.92	9.35	27.01	-0.18									
					1963.277	5.64E-06	1824.84	9.35	26.91	-0.19									
					1963.262	5.55E-06	1824.75	9.37	26.74	-0.21									
					1963.247	5.54E-06	1824.67	9.4	26.34	-0.23									
					1963.232	5.5E-06	1824.59	9.43	26.04	-0.24									
					1963.217	5.72E-06	1824.5	9.52	24.84	-0.26									

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1790.08	0.56	-5.4							
													1789.97	0.51	-5.64							
													1789.75	0.4	-5.85							
													1789.64	0.31	-5.83							
													1789.53	0.21	-5.63							
													1789.42	0.4	-5.37							
													1789.31	0.2	-5.3							
													1789.19	0.26	-5.16							
													1789.08	0.2	-5.37							
													1788.97	-0.27	-5.67							
													1788.75	0.06	-5.71							
													1788.66	-0.19	-5.61							
													1788.57	0.34	-5.37							
													1788.48	-0.21	-5.37							
													1788.39	0.21	-5.4							
													1788.3	0.53	-5.3							
													1788.2	-0.01	-5.21							
													1788.11	0.03	-5.2							
													1788.02	-0.33	-5.41							
													1787.93	-0.12	-5.81							
													1787.75	-0.34	-6.02							
													1787.64	0.16	-5.99							
													1787.53	0.07	-5.59							
													1787.42	0.58	-5.22							
													1787.31	0.12	-5.16							
													1787.19	0.21	-5.18							
													1787.08	-0.38	-5.81							
													1786.97	-0.71	-6.09							
													1786.75	-0.69	-6.24							
													1786.65	0.1	-6.21							
													1786.55	0.57	-5.99							
													1786.45	0.15	-5.95							
													1786.35	0.63	-5.41							
													1786.25	0.65	-5.42							
													1786.15	0.71	-5.58							
													1786.05	0.54	-5.96							
													1785.95	0.1	-6.19							
													1785.75	-0.16	-6.15							
													1785.64	-0.25	-6.15							
													1785.53	-0.06	-5.63							
													1785.42	0.24	-5.31							
													1785.31	0.17	-5.36							
													1785.19	-0.47	-5.82							
													1785.08	-0.41	-6.16							
													1784.97	-0.35	-6.22							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1963.202	5.79E-06	1824.42	9.62	23.73	-0.27									
					1963.186	6.16E-06	1824.34	9.63	23.55	-0.28									
					1963.171	6.35E-06	1824.25	9.53	24.8	-0.29									
					1963.156	0.000006	1824.17	9.31	27.43	-0.3									
					1963.141	5.52E-06	1824.09	9.4	26.31	-0.31									
					1963.126	5.17E-06	1824	9.45	25.75	-0.31									
					1963.111	5.16E-06	1823.92	9.52	24.88	-0.32									
					1963.095	5.1E-06	1823.84	9.61	23.8	-0.32									
					1963.08	4.72E-06	1823.75	9.67	23.11	-0.32									
					1963.065	4.16E-06	1823.67	9.72	22.51	-0.32									
					1963.05	3.98E-06	1823.59	9.74	22.24	-0.31									
					1963.035	3.82E-06	1823.5	9.69	22.84	-0.3									
					1963.02	3.76E-06	1823.42	9.66	23.21	-0.29									
					1963.005	3.92E-06	1823.34	9.64	23.46	-0.28									
					1962.989	3.87E-06	1823.25	9.54	24.64	-0.27									
					1962.974	0.000004	1823.17	9.29	27.68	-0.25									
					1962.959	3.88E-06	1823.09	9.33	27.21	-0.24									
					1962.944	3.98E-06	1823	9.32	27.37	-0.22									
					1962.929	3.95E-06	1822.92	9.32	27.29	-0.2									
					1962.914	3.94E-06	1822.84	9.37	26.72	-0.18									
					1962.898	3.91E-06	1822.75	9.4	26.39	-0.16									
					1962.883	3.95E-06	1822.67	9.52	24.88	-0.13									
					1962.868	3.9E-06	1822.59	9.53	24.74	-0.11									
					1962.853	3.99E-06	1822.5	9.54	24.67	-0.08									
					1962.838	0.000004	1822.42	9.5	25.13	-0.06									
					1962.823	3.97E-06	1822.34	9.44	25.91	-0.03									
					1962.808	3.9E-06	1822.25	9.37	26.69	-0.01									
					1962.792	3.79E-06	1822.17	9.27	27.92	0.02									
					1962.777	3.64E-06	1822.09	9.33	27.15	0.05									
					1962.762	3.77E-06	1822	9.36	26.83	0.07									
					1962.747	3.93E-06	1821.92	9.41	26.25	0.1									
					1962.732	3.96E-06	1821.84	9.46	25.6	0.13									
					1962.717	4.03E-06	1821.75	9.48	25.37	0.16									
					1962.702	3.88E-06	1821.67	9.59	24.03	0.19									
					1962.686	3.9E-06	1821.59	9.6	23.89	0.22									
					1962.671	4.01E-06	1821.5	9.59	24.08	0.24									
					1962.656	3.91E-06	1821.42	9.48	25.42	0.27									
					1962.641	4.04E-06	1821.34	9.34	27.1	0.3									
					1962.626	4.04E-06	1821.25	9.28	27.8	0.33									
					1962.611	4.07E-06	1821.17	9.26	28.04	0.36									
					1962.595	4.13E-06	1821.09	9.28	27.82	0.38									
					1962.58	4.13E-06	1821	9.32	27.33	0.41									
					1962.565	4.1E-06	1820.92	9.3	27.6	0.43									
					1962.55	4.27E-06	1820.84	9.37	26.65	0.46									
					1962.534	4.22E-06	1820.75	9.43	25.98	0.48									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1784.75	-0.53	-6.35							
													1784.63	-0.45	-6.15							
													1784.5	-0.1	-5.95							
													1784.38	0.14	-5.63							
													1784.25	0.21	-5.53							
													1784.13	0.06	-5.63							
													1784	-0.18	-5.72							
													1783.75	-0.18	-6.25							
													1783.66	-0.84	-6.21							
													1783.57	-0.45	-6.1							
													1783.48	-0.1	-6.06							
													1783.39	0.13	-5.89							
													1783.3	0.32	-5.56							
													1783.2	0.32	-5.37							
													1783.11	0.23	-5.63							
													1783.02	-0.06	-6.03							
													1782.93	-0.13	-6.16							
													1782.75	-0.39	-6.15							
													1782.63	-0.31	-6.19							
													1782.5	-0.08	-5.69							
													1782.38	-0.12	-5.51							
													1782.25	0.12	-5.42							
													1782.13	-0.3	-5.71							
													1782	-0.27	-6.2							
													1781.75	-0.49	-6.28							
													1781.63	-0.18	-6.12							
													1781.5	0.05	-5.76							
													1781.38	0.13	-5.39							
													1781.25	0.15	-5.31							
													1781.13	-0.24	-5.64							
													1781	-0.49	-5.67							
													1780.75	-0.4	-6.14							
													1780.66	-0.18	-6.07							
													1780.57	-0.22	-6.08							
													1780.48	0.36	-5.94							
													1780.39	0.2	-5.65							
													1780.3	0.22	-5.45							
													1780.2	0.23	-5.43							
													1780.11	0.01	-5.45							
													1780.02	-0.12	-5.96							
													1779.93	-0.21	-6.18							
													1779.75	-0.64	-6.21							
													1779.65	-0.5	-6.18							
													1779.55	-0.42	-6.06							
													1779.45	-0.35	-5.74							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1962.518	4.28E-06	1820.67	9.43	25.93	0.5									
					1962.502	4.47E-06	1820.59	9.47	25.46	0.53									
					1962.485	4.46E-06	1820.5	9.51	24.97	0.55									
					1962.469	4.46E-06	1820.42	9.49	25.23	0.57									
					1962.453	4.28E-06	1820.34	9.38	26.55	0.59									
					1962.437	4.33E-06	1820.25	9.34	27.09	0.6									
					1962.421	4.24E-06	1820.17	9.32	27.31	0.62									
					1962.405	4.37E-06	1820.09	9.33	27.2	0.64									
					1962.389	4.28E-06	1820	9.34	27.1	0.65									
					1962.373	4.3E-06	1819.92	9.39	26.42	0.66									
					1962.356	4.62E-06	1819.84	9.44	25.81	0.68									
					1962.34	4.63E-06	1819.75	9.43	25.93	0.69									
					1962.324	4.63E-06	1819.67	9.43	25.95	0.69									
					1962.308	4.55E-06	1819.59	9.46	25.66	0.7									
					1962.292	4.58E-06	1819.5	9.44	25.91	0.71									
					1962.276	4.63E-06	1819.42	9.39	26.42	0.71									
					1962.26	4.81E-06	1819.34	9.36	26.87	0.72									
					1962.244	4.95E-06	1819.25	9.28	27.83	0.72									
					1962.227	4.71E-06	1819.17	9.25	28.16	0.72									
					1962.211	4.82E-06	1819.09	9.26	28.05	0.71									
					1962.195	4.5E-06	1819	9.32	27.34	0.71									
					1962.179	4.34E-06	1818.92	9.27	27.92	0.7									
					1962.163	4.31E-06	1818.84	9.21	28.71	0.69									
					1962.147	4.34E-06	1818.75	9.25	28.19	0.68									
					1962.131	4.33E-06	1818.67	9.36	26.83	0.67									
					1962.115	4.18E-06	1818.59	9.37	26.71	0.65									
					1962.098	4.09E-06	1818.5	9.44	25.89	0.64									
					1962.082	4.1E-06	1818.42	9.39	26.46	0.62									
					1962.066	4.18E-06	1818.34	9.37	26.69	0.6									
					1962.05	4.05E-06	1818.25	9.28	27.75	0.58									
					1962.034	0.000004	1818.17	9.28	27.8	0.55									
					1962.018	4.2E-06	1818.09	9.32	27.34	0.53									
					1962.002	4.63E-06	1818	9.34	27.08	0.5									
					1961.985	4.91E-06	1817.92	9.36	26.81	0.48									
					1961.969	4.58E-06	1817.84	9.41	26.26	0.45									
					1961.953	4.7E-06	1817.75	9.46	25.63	0.43									
					1961.937	4.21E-06	1817.67	9.48	25.31	0.4									
					1961.921	4.04E-06	1817.59	9.49	25.22	0.37									
					1961.905	3.99E-06	1817.5	9.5	25.13	0.34									
					1961.889	3.98E-06	1817.42	9.46	25.66	0.31									
					1961.873	3.97E-06	1817.34	9.39	26.5	0.29									
					1961.856	3.94E-06	1817.25	9.33	27.22	0.26									
					1961.84	3.86E-06	1817.17	9.32	27.31	0.23									
					1961.824	3.89E-06	1817.09	9.34	27.13	0.21									
					1961.808	3.8E-06	1817	9.4	26.38	0.18									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1779.35	0.1	-5.61							
													1779.25	0.5	-5.5							
													1779.15	0.23	-5.54							
													1779.05	-0.37	-5.65							
													1778.95	-0.69	-6.21							
													1778.75	-0.61	-6.41							
													1778.66	-0.48	-6.17							
													1778.57	0.26	-5.85							
													1778.48	0.17	-5.62							
													1778.39	0.4	-5.39							
													1778.3	0.11	-5.28							
													1778.2	-0.12	-5.61							
													1778.11	0.17	-5.89							
													1778.02	-0.21	-5.81							
													1777.93	-0.49	-5.87							
													1777.75	0.11	-5.97							
													1777.64	0.13	-5.88							
													1777.53	-0.05	-5.72							
													1777.42	0.16	-5.46							
													1777.31	0.28	-5.5							
													1777.19	-0.43	-5.75							
													1777.08	-0.33	-5.92							
													1776.97	-0.53	-5.94							
													1776.75	-0.01	-6.06							
													1776.64	0.03	-5.96							
													1776.53	-0.06	-5.83							
													1776.42	-0.02	-5.67							
													1776.31	-0.21	-5.49							
													1776.19	-0.44	-5.72							
													1776.08	-0.68	-6.06							
													1775.97	-0.96	-6.08							
													1775.75	-0.76	-6.26							
													1775.66	-0.76	-6.24							
													1775.57	-0.2	-6.23							
													1775.48	0.03	-6.13							
													1775.39	0.38	-6							
													1775.3	0.81	-5.75							
													1775.2	0.73	-5.43							
													1775.11	0.72	-5.34							
													1775.02	0.27	-5.63							
													1774.93	0.05	-6.14							
													1774.75	-0.07	-6.27							
													1774.64	-0.39	-6.25							
													1774.53	0.26	-5.79							
													1774.42	0.92	-5.66							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1961.792	3.75E-06	1816.92	9.48	25.35	0.15									
					1961.776	3.85E-06	1816.84	9.57	24.24	0.13									
					1961.76	3.88E-06	1816.75	9.6	23.9	0.11									
					1961.744	3.86E-06	1816.67	9.61	23.73	0.09									
					1961.727	3.78E-06	1816.59	9.61	23.85	0.07									
					1961.711	3.85E-06	1816.5	9.55	24.49	0.05									
					1961.695	3.9E-06	1816.42	9.47	25.49	0.03									
					1961.679	3.92E-06	1816.34	9.4	26.38	0.02									
					1961.663	4.13E-06	1816.25	9.35	27.01	0									
					1961.647	4.14E-06	1816.17	9.33	27.19	-0.01									
					1961.631	3.86E-06	1816.09	9.36	26.79	-0.02									
					1961.615	3.92E-06	1816	9.43	25.98	-0.03									
					1961.598	3.99E-06	1815.92	9.49	25.25	-0.03									
					1961.582	4.05E-06	1815.84	9.56	24.4	-0.04									
					1961.566	4.19E-06	1815.75	9.63	23.48	-0.04									
					1961.55	4.34E-06	1815.67	9.61	23.79	-0.04									
					1961.531	4.23E-06	1815.59	9.53	24.7	-0.04									
					1961.513	4.33E-06	1815.5	9.49	25.21	-0.04									
					1961.494	4.11E-06	1815.42	9.46	25.55	-0.04									
					1961.476	4.06E-06	1815.34	9.43	25.98	-0.03									
					1961.457	4.01E-06	1815.25	9.39	26.48	-0.03									
					1961.439	3.96E-06	1815.17	9.38	26.58	-0.02									
					1961.42	4.09E-06	1815.09	9.41	26.28	-0.01									
					1961.402	4.02E-06	1815	9.46	25.65	0									
					1961.383	4.18E-06	1814.92	9.54	24.7	0.01									
					1961.365	4.45E-06	1814.84	9.58	24.19	0.03									
					1961.346	4.41E-06	1814.75	9.55	24.56	0.04									
					1961.328	4.56E-06	1814.67	9.53	24.76	0.06									
					1961.309	4.76E-06	1814.59	9.49	25.27	0.07									
					1961.291	4.53E-06	1814.5	9.41	26.26	0.09									
					1961.272	4.32E-06	1814.42	9.34	27.07	0.11									
					1961.254	4.16E-06	1814.34	9.31	27.39	0.12									
					1961.235	4.32E-06	1814.25	9.31	27.43	0.14									
					1961.217	4.36E-06	1814.17	9.26	28.04	0.16									
					1961.198	4.27E-06	1814.09	9.3	27.53	0.18									
					1961.18	4.01E-06	1814	9.39	26.46	0.2									
					1961.161	4.34E-06	1813.92	9.45	25.73	0.22									
					1961.143	4.34E-06	1813.84	9.49	25.29	0.23									
					1961.124	4.23E-06	1813.75	9.53	24.82	0.25									
					1961.106	4.37E-06	1813.67	9.55	24.52	0.27									
					1961.087	4.27E-06	1813.59	9.48	25.33	0.29									
					1961.069	4.25E-06	1813.5	9.48	25.41	0.31									
					1961.05	4.1E-06	1813.42	9.43	25.98	0.32									
					1961.031	4.07E-06	1813.34	9.34	27.11	0.34									
					1961.013	4.07E-06	1813.25	9.25	28.18	0.36									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1774.31	0.93	-5.16							
													1774.19	0.54	-4.95							
													1774.08	0.45	-5.36							
													1773.97	0.24	-5.76							
													1773.75	0.12	-5.76							
													1773.64	0.21	-5.74							
													1773.53	0.26	-5.69							
													1773.42	0.3	-5.38							
													1773.31	0.4	-5.12							
													1773.19	0.27	-5.08							
													1773.08	0.39	-5.18							
													1772.97	0.09	-5.58							
													1772.75	0.17	-6.03							
													1772.66	-0.24	-5.85							
													1772.57	0.13	-5.94							
													1772.48	0.41	-5.54							
													1772.39	0.54	-5.36							
													1772.3	0.17	-5.44							
													1772.2	0.17	-5.59							
													1772.11	-0.04	-5.78							
													1772.02	-0.08	-5.46							
													1771.93	-0.56	-5.71							
													1771.75	-0.03	-5.87							
													1771.63	0.32	-5.63							
													1771.5	0.38	-4.8							
													1771.38	0.22	-5.24							
													1771.25	0.23	-5.3							
													1771.13	0.1	-5.19							
													1771	-0.13	-5.98							
													1770.75	-0.25	-6.05							
													1770.64	-0.27	-5.95							
													1770.53	-0.11	-5.78							
													1770.42	-0.33	-5.66							
													1770.31	0.12	-5.39							
													1770.19	0.01	-5.56							
													1770.08	-0.29	-6.04							
													1769.97	-0.46	-6.01							
													1769.75	-0.28	-6.14							
													1769.64	0.08	-5.92							
													1769.53	0.11	-5.61							
													1769.42	0.44	-5.46							
													1769.31	0.57	-5.34							
													1769.19	0.39	-5.53							
													1769.08	0.22	-5.82							
													1768.97	-0.46	-5.61							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1960.994	4.01E-06	1813.17	9.24	28.28	0.37									
					1960.976	0.000004	1813.09	9.29	27.68	0.39									
					1960.957	3.83E-06	1813	9.31	27.39	0.4									
					1960.939	3.87E-06	1812.92	9.39	26.46	0.42									
					1960.92	3.86E-06	1812.84	9.48	25.41	0.43									
					1960.902	0.000004	1812.75	9.51	24.98	0.44									
					1960.883	3.97E-06	1812.67	9.52	24.88	0.45									
					1960.865	4.19E-06	1812.59	9.49	25.19	0.46									
					1960.846	3.95E-06	1812.5	9.44	25.81	0.47									
					1960.828	3.92E-06	1812.42	9.35	26.89	0.48									
					1960.809	3.95E-06	1812.34	9.3	27.55	0.49									
					1960.791	4.04E-06	1812.25	9.31	27.45	0.49									
					1960.772	3.96E-06	1812.17	9.25	28.16	0.5									
					1960.754	3.9E-06	1812.09	9.26	28.05	0.5									
					1960.735	3.8E-06	1812	9.3	27.58	0.51									
					1960.717	3.76E-06	1811.92	9.37	26.7	0.51									
					1960.698	3.82E-06	1811.84	9.4	26.37	0.51									
					1960.68	3.75E-06	1811.75	9.46	25.64	0.51									
					1960.661	3.97E-06	1811.67	9.53	24.76	0.51									
					1960.643	3.85E-06	1811.59	9.49	25.21	0.51									
					1960.624	3.97E-06	1811.5	9.47	25.48	0.51									
					1960.606	3.88E-06	1811.42	9.38	26.58	0.51									
					1960.587	3.89E-06	1811.34	9.33	27.15	0.5									
					1960.569	3.96E-06	1811.25	9.3	27.54	0.5									
					1960.55	4.18E-06	1811.17	9.3	27.55	0.49									
					1960.534	4.3E-06	1811.09	9.33	27.24	0.49									
					1960.517	4.19E-06	1811	9.36	26.88	0.48									
					1960.501	4.41E-06	1810.92	9.39	26.46	0.47									
					1960.484	4.25E-06	1810.84	9.41	26.23	0.47									
					1960.468	4.3E-06	1810.75	9.44	25.87	0.46									
					1960.452	4.46E-06	1810.67	9.48	25.37	0.45									
					1960.435	4.35E-06	1810.59	9.47	25.45	0.44									
					1960.419	4.34E-06	1810.5	9.46	25.56	0.43									
					1960.402	4.53E-06	1810.42	9.45	25.73	0.42									
					1960.386	4.71E-06	1810.34	9.4	26.36	0.41									
					1960.37	4.75E-06	1810.25	9.35	26.96	0.4									
					1960.353	4.95E-06	1810.17	9.3	27.55	0.39									
					1960.337	4.83E-06	1810.09	9.32	27.33	0.38									
					1960.32	4.59E-06	1810	9.32	27.31	0.37									
					1960.304	4.55E-06	1809.92	9.36	26.83	0.36									
					1960.288	4.54E-06	1809.84	9.39	26.44	0.35									
					1960.271	4.49E-06	1809.75	9.45	25.71	0.34									
					1960.255	4.62E-06	1809.67	9.53	24.8	0.33									
					1960.239	5.1E-06	1809.59	9.55	24.58	0.32									
					1960.222	5.2E-06	1809.5	9.51	25.03	0.31									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1768.75	-0.53	-6.06							
													1768.64	-0.37	-5.85							
													1768.53	-0.1	-5.82							
													1768.42	-0.1	-5.79							
													1768.31	0.48	-5.06							
													1768.19	0.72	-5.21							
													1768.08	0.19	-5.48							
													1767.97	-0.05	-5.9							
													1767.75	0.63	-6.05							
													1767.65	-0.23	-5.8							
													1767.55	0.08	-5.99							
													1767.45	0.32	-5.64							
													1767.35	-0.12	-5.45							
													1767.25	0.61	-5.11							
													1767.15	0.86	-5.23							
													1767.05	0.56	-5.63							
													1766.95	0.57	-5.91							
													1766.75	0.06	-6.12							
													1766.65	0.03	-6.08							
													1766.55	-0.1	-6.17							
													1766.45	0.18	-5.85							
													1766.35	0.09	-5.75							
													1766.25	-0.04	-5.27							
													1766.15	0.08	-5.23							
													1766.05	-0.3	-5.51							
													1765.95	-0.63	-5.85							
													1765.75	-0.96	-6.15							
													1765.66	-0.96	-6.1							
													1765.57	-0.23	-5.84							
													1765.48	-0.53	-5.98							
													1765.39	-0.09	-5.71							
													1765.3	-0.05	-5.66							
													1765.2	0.12	-5.85							
													1765.11	0	-5.96							
													1765.02	-0.33	-5.86							
													1764.93	0.11	-5.91							
													1764.75	-0.01	-6.02							
													1764.63	0.57	-5.64							
													1764.5	0.69	-5.44							
													1764.38	1.06	-5.47							
													1764.25	0.31	-6							
													1764.13	-0.28	-5.98							
													1764	-0.27	-5.98							
													1763.75	-0.23	-5.95							
													1763.61	0.24	-5.67							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003		Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1960.206	5.77E-06	1809.42	9.47	25.48	0.3									
					1960.189	5.6E-06	1809.34	9.43	26.02	0.3									
					1960.173	5.71E-06	1809.25	9.34	27.01	0.29									
					1960.157	5.81E-06	1809.17	9.28	27.8	0.28									
					1960.14	5.56E-06	1809.09	9.31	27.39	0.27									
					1960.124	5.16E-06	1809	9.39	26.42	0.27									
					1960.107	5.08E-06	1808.92	9.49	25.31	0.26									
					1960.091	4.94E-06	1808.84	9.53	24.76	0.26									
					1960.075	4.96E-06	1808.75	9.53	24.82	0.26									
					1960.058	4.85E-06	1808.67	9.6	23.91	0.25									
					1960.042	5.2E-06	1808.59	9.55	24.52	0.25									
					1960.025	5.32E-06	1808.5	9.53	24.72	0.25									
					1960.009	5.21E-06	1808.42	9.5	25.13	0.25									
					1959.993	4.84E-06	1808.34	9.44	25.85	0.25									
					1959.976	4.71E-06	1808.25	9.37	26.68	0.25									
					1959.96	4.42E-06	1808.17	9.33	27.19	0.25									
					1959.943	4.16E-06	1808.09	9.34	27.08	0.26									
					1959.927	4.05E-06	1808	9.34	27.07	0.26									
					1959.911	0.000004	1807.92	9.35	26.95	0.26									
					1959.894	3.92E-06	1807.84	9.41	26.16	0.27									
					1959.878	4.18E-06	1807.75	9.48	25.4	0.27									
					1959.861	4.11E-06	1807.67	9.5	25.12	0.28									
					1959.845	4.16E-06	1807.59	9.56	24.34	0.28									
					1959.829	4.07E-06	1807.5	9.51	24.97	0.29									
					1959.812	4.17E-06	1807.42	9.45	25.73	0.29									
					1959.796	4.21E-06	1807.34	9.36	26.86	0.3									
					1959.78	4.21E-06	1807.25	9.3	27.53	0.3									
					1959.763	3.88E-06	1807.17	9.29	27.68	0.3									
					1959.747	3.76E-06	1807.09	9.3	27.56	0.31									
					1959.73	3.9E-06	1807	9.32	27.32	0.31									
					1959.714	3.84E-06	1806.92	9.4	26.34	0.32									
					1959.698	0.000004	1806.84	9.47	25.44	0.32									
					1959.681	4.05E-06	1806.75	9.54	24.67	0.32									
					1959.665	4.01E-06	1806.67	9.55	24.52	0.33									
					1959.648	4.21E-06	1806.59	9.47	25.53	0.33									
					1959.632	4.39E-06	1806.5	9.44	25.84	0.33									
					1959.616	4.22E-06	1806.42	9.38	26.58	0.34									
					1959.599	4.32E-06	1806.34	9.32	27.37	0.34									
					1959.583	4.22E-06	1806.25	9.28	27.78	0.34									
					1959.566	4.32E-06	1806.17	9.28	27.8	0.34									
					1959.55	4.48E-06	1806.09	9.28	27.8	0.34									
					1959.536	4.49E-06	1806	9.31	27.43	0.34									
					1959.523	4.73E-06	1805.92	9.37	26.74	0.33									
					1959.509	5.12E-06	1805.84	9.44	25.89	0.33									
					1959.495	5.1E-06	1805.75	9.5	25.17	0.33									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1763.46	0.61	-5.37							
													1763.32	0.97	-5.08							
													1763.18	1.31	-5.43							
													1763.04	0.34	-6.01							
													1762.75	0.11	-5.98							
													1762.63	-0.21	-5.95							
													1762.5	0.22	-5.88							
													1762.38	1.46	-5.58							
													1762.25	1.65	-5.16							
													1762.13	1.55	-5.49							
													1762	0.04	-5.87							
													1761.75	-0.36	-6.01							
													1761.63	-0.05	-5.88							
													1761.5	0.41	-5.69							
													1761.38	0.87	-5.07							
													1761.25	0.89	-4.97							
													1761.13	0.46	-5.46							
													1761	0.41	-5.84							
													1760.75	-0.04	-6.14							
													1760.64	0.1	-6.01							
													1760.53	0.33	-5.73							
													1760.42	0.63	-5.43							
													1760.31	0.15	-5.35							
													1760.19	0.22	-5.55							
													1760.08	0.11	-5.71							
													1759.97	-0.02	-5.74							
													1759.75	0.06	-5.88							
													1759.63	-0.02	-5.84							
													1759.5	0.45	-5.79							
													1759.38	0.78	-5.54							
													1759.25	0.79	-5.3							
													1759.13	0.83	-5.51							
													1759	0.33	-5.79							
													1758.75	-0.15	-5.88							
													1758.63	0.49	-5.87							
													1758.5	0.92	-5.6							
													1758.38	0.55	-5.28							
													1758.25	0.29	-5.44							
													1758.13	0.18	-5.92							
													1758	0	-5.95							
													1757.75	0.42	-5.99							
													1757.63	0.8	-5.89							
													1757.5	0.67	-5.59							
													1757.38	0.7	-5.54							
													1757.25	0.39	-5.66							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1959.482	4.99E-06	1805.67	9.55	24.56	0.32									
					1959.468	4.89E-06	1805.59	9.57	24.29	0.32									
					1959.454	4.65E-06	1805.5	9.53	24.73	0.32									
					1959.44	4.97E-06	1805.42	9.47	25.46	0.31									
					1959.427	5.2E-06	1805.34	9.4	26.36	0.31									
					1959.413	5.69E-06	1805.25	9.33	27.24	0.3									
					1959.399	5.6E-06	1805.17	9.27	27.92	0.29									
					1959.386	5.65E-06	1805.09	9.27	27.89	0.29									
					1959.372	5.46E-06	1805	9.33	27.19	0.28									
					1959.358	5.41E-06	1804.92	9.34	27.1	0.27									
					1959.345	5.69E-06	1804.84	9.36	26.79	0.26									
					1959.331	5.55E-06	1804.75	9.39	26.47	0.25									
					1959.317	5.68E-06	1804.67	9.46	25.67	0.24									
					1959.303	6.28E-06	1804.59	9.5	25.18	0.23									
					1959.29	6.91E-06	1804.5	9.44	25.9	0.22									
					1959.276	7.13E-06	1804.42	9.35	26.9	0.21									
					1959.262	6.61E-06	1804.34	9.32	27.36	0.2									
					1959.249	6.17E-06	1804.25	9.33	27.23	0.18									
					1959.235	6.27E-06	1804.17	9.3	27.55	0.17									
					1959.221	5.44E-06	1804.09	9.32	27.33	0.16									
					1959.208	5.48E-06	1804	9.39	26.5	0.15									
					1959.194	5.03E-06	1803.92	9.5	25.12	0.14									
					1959.18	4.63E-06	1803.84	9.55	24.56	0.13									
					1959.166	4.2E-06	1803.75	9.55	24.52	0.12									
					1959.153	4.38E-06	1803.67	9.56	24.4	0.11									
					1959.139	4.47E-06	1803.59	9.62	23.72	0.11									
					1959.125	4.19E-06	1803.5	9.55	24.48	0.1									
					1959.112	4.33E-06	1803.42	9.44	25.85	0.09									
					1959.098	4.48E-06	1803.34	9.46	25.63	0.09									
					1959.084	4.29E-06	1803.25	9.46	25.61	0.09									
					1959.071	4.26E-06	1803.17	9.43	25.98	0.08									
					1959.057	4.71E-06	1803.09	9.45	25.74	0.08									
					1959.043	4.44E-06	1803	9.5	25.09	0.08									
					1959.029	4.66E-06	1802.92	9.6	23.91	0.09									
					1959.016	4.63E-06	1802.84	9.61	23.83	0.09									
					1959.002	4.71E-06	1802.75	9.59	23.97	0.09									
					1958.988	4.61E-06	1802.67	9.56	24.4	0.1									
					1958.975	4.57E-06	1802.59	9.52	24.94	0.1									
					1958.961	4.51E-06	1802.5	9.45	25.73	0.11									
					1958.947	4.53E-06	1802.42	9.36	26.83	0.11									
					1958.934	4.47E-06	1802.34	9.33	27.14	0.12									
					1958.92	4.55E-06	1802.25	9.31	27.46	0.13									
					1958.906	4.49E-06	1802.17	9.28	27.8	0.14									
					1958.892	4.43E-06	1802.09	9.31	27.48	0.14									
					1958.879	4.3E-06	1802	9.31	27.41	0.15									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1757.13	0.35	-5.59							
													1757	0.28	-5.94							
													1756.75	-0.07	-5.94							
													1756.63	0.31	-5.81							
													1756.5	0.71	-5.47							
													1756.38	0.58	-5.12							
													1756.25	0.56	-5.15							
													1756.13	0.39	-5.41							
													1756	0.14	-6.15							
													1755.75	-0.45	-6.3							
													1755.65	-0.17	-6.08							
													1755.55	1.12	-5.75							
													1755.45	1.12	-5.43							
													1755.35	0.5	-5.18							
													1755.25	0.64	-5.43							
													1755.15	-0.18	-5.88							
													1755.05	-0.19	-6.2							
													1754.95	-0.12	-6.15							
													1754.75	-0.38	-6.18							
													1754.64	-0.16	-5.95							
													1754.53	0.31	-5.46							
													1754.42	0.42	-5.33							
													1754.31	0.68	-5.42							
													1754.19	0.43	-5.55							
													1754.08	0.32	-5.72							
													1753.97	0.28	-5.67							
													1753.75	0.51	-5.85							
													1753.64	0.44	-5.79							
													1753.53	0.45	-5.38							
													1753.42	0.7	-5.16							
													1753.31	0.47	-5.09							
													1753.19	0.41	-5.44							
													1753.08	-0.26	-5.84							
													1752.97	-0.7	-5.86							
													1752.75	0.14	-5.96							
													1752.63	0.14	-5.84							
													1752.5	0.41	-5.29							
													1752.38	0.25	-5.12							
													1752.25	-0.05	-5.49							
													1752.13	0.54	-5.64							
													1752	0.27	-5.86							
													1751.75	-0.32	-5.98							
													1751.63	0.17	-5.58							
													1751.5	0.17	-5.48							
													1751.38	0.53	-5.02							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1958.865	4.29E-06	1801.92	9.38	26.55	0.16									
					1958.851	4.24E-06	1801.84	9.45	25.68	0.16									
					1958.838	4.29E-06	1801.75	9.48	25.34	0.17									
					1958.824	4.43E-06	1801.67	9.49	25.19	0.17									
					1958.81	5.01E-06	1801.59	9.5	25.13	0.18									
					1958.797	0.000005	1801.5	9.4	26.28	0.18									
					1958.783	4.81E-06	1801.42	9.37	26.64	0.19									
					1958.769	4.86E-06	1801.34	9.35	27.01	0.19									
					1958.755	4.89E-06	1801.25	9.33	27.15	0.19									
					1958.742	4.96E-06	1801.17	9.29	27.68	0.2									
					1958.728	4.96E-06	1801.09	9.34	27.12	0.2									
					1958.714	4.96E-06	1801	9.39	26.43	0.2									
					1958.701	4.97E-06	1800.92	9.44	25.9	0.2									
					1958.687	4.9E-06	1800.84	9.42	26.08	0.2									
					1958.673	4.8E-06	1800.75	9.49	25.25	0.19									
					1958.66	5.07E-06	1800.67	9.53	24.77	0.19									
					1958.646	5.2E-06	1800.59	9.53	24.77	0.19									
					1958.632	5.31E-06	1800.5	9.49	25.23	0.19									
					1958.618	5.47E-06	1800.42	9.43	25.95	0.18									
					1958.605	5.71E-06	1800.34	9.38	26.63	0.18									
					1958.591	5.8E-06	1800.25	9.33	27.16	0.17									
					1958.577	5.83E-06	1800.17	9.31	27.43	0.17									
					1958.564	5.71E-06	1800.09	9.32	27.32	0.16									
					1958.55	5.79E-06	1800	9.33	27.22	0.15									
					1958.538	5.97E-06	1799.92	9.35	26.95	0.15									
					1958.526	6.07E-06	1799.84	9.38	26.61	0.14									
					1958.515	6.2E-06	1799.75	9.45	25.77	0.13									
					1958.503	6.7E-06	1799.67	9.51	24.96	0.12									
					1958.491	6.27E-06	1799.59	9.52	24.85	0.11									
					1958.479	6.21E-06	1799.5	9.49	25.26	0.1									
					1958.468	6.1E-06	1799.42	9.42	26.04	0.09									
					1958.456	6.32E-06	1799.34	9.37	26.74	0.08									
					1958.444	5.96E-06	1799.25	9.34	27.02	0.06									
					1958.432	6.23E-06	1799.17	9.27	27.92	0.05									
					1958.421	6.06E-06	1799.09	9.33	27.24	0.04									
					1958.409	6.2E-06	1799	9.49	25.21	0.03									
					1958.397	6.24E-06	1798.92	9.54	24.64	0.02									
					1958.385	6.72E-06	1798.84	9.59	24.08	0.01									
					1958.374	7.42E-06	1798.75	9.53	24.73	0									
					1958.362	7.86E-06	1798.67	9.58	24.15	-0.01									
					1958.35	1.05E-05	1798.59	9.6	23.93	-0.02									
					1958.338	1.03E-05	1798.5	9.48	25.31	-0.03									
					1958.326	9.03E-06	1798.42	9.38	26.58	-0.04									
					1958.315	8.48E-06	1798.34	9.38	26.58	-0.05									
					1958.303	8.05E-06	1798.25	9.36	26.82	-0.06									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1751.25	2.14	-4.97							
													1751.13	1.44	-5.27							
													1751	0.82	-5.63							
													1750.75	0.36	-5.82							
													1750.64	1.06	-5.79							
													1750.53	0.68	-5.28							
													1750.42	0.45	-5.3							
													1750.31	0.64	-5.31							
													1750.19	-0.42	-5.9							
													1750.08	-0.36	-6.08							
													1749.97	-0.29	-5.95							
													1749.75	-0.6	-6.11							
													1749.61	-0.24	-5.98							
													1749.46	0.29	-5.71							
													1749.32	-0.08	-5.73							
													1749.04	-0.21	-6.04							
													1748.75	-0.53	-6.12							
													1748.65	-0.77	-5.94							
													1748.55	-0.18	-5.92							
													1748.45	0.03	-5.5							
													1748.35	-0.58	-5.38							
													1748.25	0.31	-5.3							
													1748.15	0.03	-5.26							
													1748.05	0.1	-5.68							
													1747.95	-0.76	-6.3							
													1747.75	-0.85	-6.55							
													1747.64	-0.63	-6.39							
													1747.53	-0.12	-6.23							
													1747.42	-0.01	-6.09							
													1747.31	0.21	-5.65							
													1747.19	0.17	-5.62							
													1747.08	0.04	-5.74							
													1746.97	-0.3	-6							
													1746.75	-0.23	-6.29							
													1746.63	-0.46	-6.22							
													1746.5	0.01	-6.07							
													1746.38	-0.16	-5.76							
													1746.25	0.36	-5.53							
													1746.13	0.28	-5.22							
													1746	-0.39	-5.87							
													1745.75	-0.52	-6.14							
													1745.64	-0.34	-5.73							
													1745.53	-0.24	-5.74							
													1745.42	0.02	-5.66							
													1745.31	-0.19	-5.37							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1958.291	7.69E-06	1798.17	9.32	27.31	-0.07									
					1958.279	7.53E-06	1798.09	9.39	26.41	-0.07									
					1958.268	7.5E-06	1798	9.48	25.41	-0.08									
					1958.256	8.81E-06	1797.92	9.53	24.8	-0.09									
					1958.244	0.000009	1797.84	9.56	24.35	-0.09									
					1958.232	0.00001	1797.75	9.6	23.96	-0.1									
					1958.221	9.53E-06	1797.67	9.58	24.17	-0.1									
					1958.209	9.05E-06	1797.59	9.52	24.86	-0.11									
					1958.197	8.49E-06	1797.5	9.47	25.5	-0.11									
					1958.185	6.44E-06	1797.42	9.4	26.31	-0.11									
					1958.174	5.48E-06	1797.34	9.34	27.11	-0.12									
					1958.162	4.45E-06	1797.25	9.32	27.31	-0.12									
					1958.15	4.08E-06	1797.17	9.32	27.31	-0.12									
					1958.138	4.08E-06	1797.09	9.34	27.05	-0.13									
					1958.126	4.67E-06	1797	9.38	26.64	-0.13									
					1958.115	4.42E-06	1796.92	9.46	25.67	-0.13									
					1958.103	4.42E-06	1796.84	9.57	24.34	-0.13									
					1958.091	4.28E-06	1796.75	9.65	23.26	-0.13									
					1958.079	4.37E-06	1796.67	9.64	23.42	-0.13									
					1958.068	4.1E-06	1796.59	9.57	24.26	-0.13									
					1958.056	4.2E-06	1796.5	9.48	25.33	-0.13									
					1958.044	4.27E-06	1796.42	9.39	26.43	-0.13									
					1958.032	4.2E-06	1796.34	9.32	27.28	-0.13									
					1958.021	4.49E-06	1796.25	9.31	27.43	-0.13									
					1958.009	4.16E-06	1796.17	9.29	27.68	-0.13									
					1957.997	4.26E-06	1796.09	9.3	27.56	-0.13									
					1957.985	3.99E-06	1796	9.35	27	-0.13									
					1957.974	3.9E-06	1795.92	9.4	26.34	-0.13									
					1957.962	3.89E-06	1795.84	9.46	25.59	-0.13									
					1957.95	3.88E-06	1795.75	9.55	24.55	-0.13									
					1957.938	3.95E-06	1795.67	9.67	23.1	-0.13									
					1957.926	4.19E-06	1795.59	9.69	22.76	-0.13									
					1957.915	4.13E-06	1795.5	9.59	24.09	-0.13									
					1957.903	3.94E-06	1795.42	9.52	24.84	-0.13									
					1957.891	4.08E-06	1795.34	9.42	26.16	-0.13									
					1957.879	3.96E-06	1795.25	9.33	27.2	-0.13									
					1957.868	3.91E-06	1795.17	9.32	27.31	-0.12									
					1957.856	4.04E-06	1795.09	9.36	26.79	-0.12									
					1957.844	4.06E-06	1795	9.35	26.92	-0.12									
					1957.832	4.1E-06	1794.92	9.38	26.58	-0.12									
					1957.821	4.15E-06	1794.84	9.44	25.8	-0.12									
					1957.809	4.23E-06	1794.75	9.57	24.31	-0.11									
					1957.797	4.31E-06	1794.67	9.57	24.27	-0.11									
					1957.785	4.19E-06	1794.59	9.55	24.54	-0.11									
					1957.774	4.26E-06	1794.5	9.5	25.16	-0.11									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1745.19	0.14	-5.26							
													1745.08	0.35	-5.65							
													1744.97	-0.41	-6.04							
													1744.86	-0.65	-6.2							
													1744.75	-0.7	-6.2							
													1744.65	-1.02	-6.03							
													1744.55	-0.57	-6.16							
													1744.45	1.03	-5.84							
													1744.35	0.44	-5.61							
													1744.25	0.14	-5.29							
													1744.15	-0.37	-5.52							
													1744.05	-0.71	-5.6							
													1743.95	-0.73	-5.72							
													1743.75	-0.63	-5.85							
													1743.65	-0.54	-5.72							
													1743.55	-0.33	-5.71							
													1743.45	0.3	-5.57							
													1743.35	0.1	-5.37							
													1743.25	0.11	-5.28							
													1743.15	-0.09	-5.46							
													1743.05	-0.32	-5.88							
													1742.95	-0.39	-6.04							
													1742.75	-0.47	-6.2							
													1742.65	-0.59	-6.1							
													1742.55	-0.12	-6.02							
													1742.45	0.27	-5.75							
													1742.35	0.16	-5.51							
													1742.25	0.07	-5.36							
													1742.15	0.13	-5.47							
													1742.05	0.04	-5.82							
													1741.95	-0.12	-5.89							
													1741.75	-0.27	-6.08							
													1741.64	-0.32	-5.9							
													1741.53	-0.05	-5.68							
													1741.42	-0.09	-5.75							
													1741.31	-0.09	-5.59							
													1741.19	0.24	-5.71							
													1741.08	0.56	-5.64							
													1740.97	0.43	-6.03							
													1740.75	-0.21	-6.1							
													1740.65	0.23	-5.94							
													1740.55	0.42	-5.61							
													1740.45	0.03	-5.46							
													1740.35	0.04	-5.31							
													1740.25	0.01	-5.22							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1957.762	4.47E-06	1794.42	9.44	25.85	-0.11									
					1957.75	4.38E-06	1794.34	9.34	27.07	-0.1									
					1957.738	4.22E-06	1794.25	9.35	26.92	-0.1									
					1957.726	4.27E-06	1794.17	9.3	27.55	-0.1									
					1957.715	4.25E-06	1794.09	9.32	27.33	-0.1									
					1957.703	4.48E-06	1794	9.34	27.03	-0.1									
					1957.691	4.55E-06	1793.92	9.38	26.54	-0.09									
					1957.679	4.51E-06	1793.84	9.47	25.48	-0.09									
					1957.668	4.5E-06	1793.75	9.55	24.57	-0.09									
					1957.656	4.68E-06	1793.67	9.57	24.22	-0.09									
					1957.644	4.88E-06	1793.59	9.56	24.42	-0.09									
					1957.632	4.87E-06	1793.5	9.5	25.1	-0.08									
					1957.621	4.89E-06	1793.42	9.45	25.75	-0.08									
					1957.609	4.91E-06	1793.34	9.4	26.33	-0.08									
					1957.597	4.77E-06	1793.25	9.35	26.99	-0.08									
					1957.585	4.85E-06	1793.17	9.3	27.56	-0.07									
					1957.574	4.99E-06	1793.09	9.3	27.55	-0.07									
					1957.562	5.03E-06	1793	9.32	27.36	-0.06									
					1957.55	4.83E-06	1792.92	9.38	26.55	-0.06									
					1957.534	4.74E-06	1792.84	9.43	25.96	-0.05									
					1957.519	4.94E-06	1792.75	9.5	25.15	-0.04									
					1957.503	4.93E-06	1792.67	9.59	24.03	-0.04									
					1957.488	5.04E-06	1792.59	9.62	23.67	-0.03									
					1957.472	5.16E-06	1792.5	9.63	23.6	-0.02									
					1957.456	5.39E-06	1792.42	9.59	23.98	-0.01									
					1957.441	5.39E-06	1792.34	9.55	24.54	0									
					1957.425	5.15E-06	1792.25	9.48	25.35	0.02									
					1957.409	5.1E-06	1792.17	9.35	26.95	0.03									
					1957.394	5.35E-06	1792.09	9.45	25.73	0.05									
					1957.378	5.17E-06	1792	9.49	25.25	0.07									
					1957.363	5.09E-06	1791.92	9.53	24.76	0.08									
					1957.347	5.08E-06	1791.84	9.56	24.36	0.1									
					1957.331	5.14E-06	1791.75	9.55	24.48	0.12									
					1957.316	5.02E-06	1791.67	9.47	25.49	0.14									
					1957.3	5.06E-06	1791.59	9.4	26.3	0.17									
					1957.284	5.03E-06	1791.5	9.34	27.11	0.19									
					1957.269	4.94E-06	1791.42	9.32	27.31	0.21									
					1957.253	4.75E-06	1791.34	9.33	27.19	0.23									
					1957.238	4.81E-06	1791.25	9.33	27.21	0.26									
					1957.222	4.97E-06	1791.17	9.32	27.31	0.28									
					1957.206	4.89E-06	1791.09	9.41	26.2	0.3									
					1957.191	4.98E-06	1791	9.51	25	0.33									
					1957.175	4.78E-06	1790.92	9.56	24.46	0.35									
					1957.159	5.07E-06	1790.84	9.55	24.48	0.38									
					1957.144	5.25E-06	1790.75	9.52	24.84	0.4									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1740.15	-0.54	-5.54							
													1740.05	-0.1	-5.86							
													1739.95	-0.53	-5.8							
													1739.75	-0.38	-5.98							
													1739.61	0.4	-5.94							
													1739.46	0.36	-5.63							
													1739.32	0.33	-5.25							
													1739.18	0.91	-5.23							
													1739.04	0.53	-5.31							
													1738.75	-0.12	-5.86							
													1738.63	-0.05	-5.65							
													1738.5	0.36	-5.7							
													1738.38	0.19	-5.44							
													1738.25	0.11	-5.33							
													1738.13	0.2	-5.51							
													1738	-0.33	-5.83							
													1737.75	-0.5	-6.07							
													1737.65	-0.13	-5.94							
													1737.55	0.16	-5.67							
													1737.45	0	-5.66							
													1737.35	0.02	-5.52							
													1737.25	0.22	-5.48							
													1737.15	0.09	-5.57							
													1737.05	-0.03	-5.93							
													1736.95	0.15	-6							
													1736.75	-0.22	-6.03							
													1736.67	0.31	-5.91							
													1736.58	0.16	-5.65							
													1736.5	0.49	-5.35							
													1736.42	0.58	-5.33							
													1736.33	0.58	-5.15							
													1736.25	0.59	-4.95							
													1736.17	-0.56	-5.75							
													1736.08	-1	-5.97							
													1736	-0.51	-5.82							
													1735.92	-0.31	-5.8							
													1735.75	-0.36	-5.89							
													1735.65	0.25	-5.16							
													1735.55	-0.4	-5.42							
													1735.45	-0.26	-5.26							
													1735.25	0.18	-5.28							
													1735.15	0.32	-5.74							
													1735.05	-0.52	-5.63							
													1734.92	-0.44	-5.69							
													1734.75	-0.02	-5.87							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1957.128	5.27E-06	1790.67	9.44	25.85	0.42									
					1957.113	5.03E-06	1790.59	9.36	26.77	0.45									
					1957.097	4.83E-06	1790.5	9.33	27.19	0.47									
					1957.081	4.45E-06	1790.42	9.33	27.19	0.49									
					1957.066	4.81E-06	1790.34	9.32	27.27	0.52									
					1957.05	4.54E-06	1790.25	9.29	27.72	0.54									
					1957.034	4.59E-06	1790.17	9.27	27.92	0.56									
					1957.019	4.45E-06	1790.09	9.34	27.02	0.58									
					1957.003	4.35E-06	1790	9.38	26.57	0.6									
					1956.988	4.14E-06	1789.92	9.42	26.14	0.62									
					1956.972	4.13E-06	1789.84	9.42	26.05	0.63									
					1956.956	4.13E-06	1789.75	9.41	26.22	0.65									
					1956.941	4.1E-06	1789.67	9.41	26.23	0.66									
					1956.925	4.16E-06	1789.59	9.39	26.5	0.68									
					1956.909	4.17E-06	1789.5	9.31	27.48	0.69									
					1956.894	4.15E-06	1789.42	9.25	28.11	0.7									
					1956.878	4.3E-06	1789.34	9.27	27.92	0.71									
					1956.863	4.41E-06	1789.25	9.27	27.94	0.72									
					1956.847	4.54E-06	1789.17	9.25	28.16	0.73									
					1956.831	4.4E-06	1789.09	9.27	27.94	0.73									
					1956.816	4.58E-06	1789	9.31	27.45	0.74									
					1956.8	4.58E-06	1788.92	9.41	26.18	0.74									
					1956.784	4.85E-06	1788.84	9.47	25.47	0.75									
					1956.769	4.94E-06	1788.75	9.5	25.18	0.75									
					1956.753	4.76E-06	1788.67	9.52	24.84	0.75									
					1956.738	4.93E-06	1788.59	9.53	24.77	0.75									
					1956.722	5.15E-06	1788.5	9.48	25.33	0.75									
					1956.706	5.89E-06	1788.42	9.4	26.37	0.76									
					1956.691	5.75E-06	1788.34	9.31	27.44	0.76									
					1956.675	5.75E-06	1788.25	9.25	28.17	0.75									
					1956.659	6.29E-06	1788.17	9.24	28.28	0.75									
					1956.644	6.34E-06	1788.09	9.26	28.04	0.75									
					1956.628	6.22E-06	1788	9.27	27.95	0.75									
					1956.613	6.15E-06	1787.92	9.32	27.36	0.75									
					1956.597	6.14E-06	1787.84	9.41	26.27	0.74									
					1956.581	0.000006	1787.75	9.46	25.56	0.74									
					1956.566	0.000006	1787.67	9.53	24.76	0.73									
					1956.55	6.29E-06	1787.59	9.56	24.44	0.73									
					1956.528	6.41E-06	1787.5	9.55	24.49	0.73									
					1956.507	6.23E-06	1787.42	9.4	26.34	0.72									
					1956.485	6.03E-06	1787.34	9.33	27.2	0.72									
					1956.463	6.27E-06	1787.25	9.32	27.34	0.71									
					1956.441	6.43E-06	1787.17	9.28	27.8	0.71									
					1956.42	6.12E-06	1787.09	9.36	26.85	0.7									
					1956.398	6.22E-06	1787	9.41	26.2	0.7									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1734.63	0.26	-5.46							
													1734.5	0.93	-5.48							
													1734.38	0.42	-5.2							
													1734.25	-0.03	-5.34							
													1734.13	-0.04	-5.76							
													1734	-0.24	-6.15							
													1733.75	-0.17	-6.19							
													1733.55	0.35	-5.55							
													1733.45	0.4	-5.37							
													1733.35	0.52	-5.12							
													1733.25	0.11	-5.4							
													1733.15	-0.06	-5.66							
													1733.05	-0.39	-5.95							
													1732.95	-0.35	-5.87							
													1732.75	0.34	-5.89							
													1732.63	0.35	-5.36							
													1732.5	0.37	-5.31							
													1732.38	0.48	-5.44							
													1732.25	-0.1	-5.82							
													1732.13	-0.08	-5.94							
													1732	0.02	-5.86							
													1731.75	-0.19	-6.08							
													1731.65	0.2	-5.85							
													1731.55	0.44	-5.49							
													1731.45	0.38	-5.16							
													1731.35	0.44	-5.11							
													1731.25	0.14	-5.39							
													1731.15	-0.25	-5.95							
													1731.05	-0.27	-6.07							
													1730.95	-0.41	-5.8							
													1730.75	-0.5	-6.02							
													1730.63	-0.49	-5.78							
													1730.5	0.39	-5.51							
													1730.38	0.4	-5.24							
													1730.25	0.36	-5.51							
													1730.13	-0.1	-6.06							
													1730	0.13	-5.93							
													1729.75	-0.07	-5.98							
													1729.64	-0.03	-5.88							
													1729.53	-0.06	-5.55							
													1729.42	-0.19	-5.59							
													1729.31	0.23	-5.52							
													1729.19	0.1	-5.42							
													1729.08	0.16	-6.09							
													1728.97	0.06	-6.24							

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o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1956.376	6.32E-06	1786.92	9.46	25.58	0.69									
					1956.354	6.46E-06	1786.84	9.49	25.29	0.69									
					1956.333	6.57E-06	1786.75	9.5	25.15	0.68									
					1956.311	6.29E-06	1786.67	9.48	25.37	0.68									
					1956.289	6.29E-06	1786.59	9.44	25.89	0.67									
					1956.267	6.25E-06	1786.5	9.41	26.21	0.66									
					1956.246	6.33E-06	1786.42	9.37	26.74	0.66									
					1956.224	4.48E-06	1786.34	9.33	27.17	0.65									
					1956.202	3.92E-06	1786.25	9.26	28	0.64									
					1956.18	3.9E-06	1786.17	9.23	28.41	0.64									
					1956.159	4.32E-06	1786.09	9.3	27.55	0.63									
					1956.137	4.33E-06	1786	9.32	27.32	0.62									
					1956.115	4.46E-06	1785.92	9.42	26.1	0.61									
					1956.093	4.43E-06	1785.84	9.45	25.73	0.6									
					1956.072	4.43E-06	1785.75	9.45	25.78	0.59									
					1956.05	4.53E-06	1785.67	9.43	25.98	0.58									
					1956.028	4.49E-06	1785.59	9.45	25.7	0.56									
					1956.007	4.73E-06	1785.5	9.44	25.79	0.55									
					1955.985	4.58E-06	1785.42	9.36	26.88	0.54									
					1955.963	4.63E-06	1785.34	9.29	27.67	0.52									
					1955.941	4.59E-06	1785.25	9.27	27.9	0.51									
					1955.92	4.46E-06	1785.17	9.26	28.04	0.49									
					1955.898	4.58E-06	1785.09	9.28	27.82	0.48									
					1955.876	4.78E-06	1785	9.3	27.57	0.46									
					1955.854	5.11E-06	1784.92	9.37	26.7	0.44									
					1955.833	5.82E-06	1784.84	9.42	26.14	0.42									
					1955.811	6.44E-06	1784.75	9.47	25.51	0.4									
					1955.789	6.41E-06	1784.67	9.53	24.76	0.39									
					1955.767	5.99E-06	1784.59	9.53	24.76	0.37									
					1955.746	5.75E-06	1784.5	9.47	25.46	0.35									
					1955.724	5.78E-06	1784.42	9.47	25.49	0.33									
					1955.702	5.57E-06	1784.34	9.44	25.83	0.31									
					1955.68	5.15E-06	1784.25	9.35	26.9	0.29									
					1955.659	5.25E-06	1784.17	9.29	27.68	0.27									
					1955.637	5.31E-06	1784.09	9.3	27.51	0.25									
					1955.615	5.78E-06	1784	9.33	27.17	0.23									
					1955.593	5.71E-06	1783.92	9.35	26.91	0.21									
					1955.572	5.91E-06	1783.84	9.36	26.81	0.2									
					1955.55	5.64E-06	1783.75	9.47	25.5	0.18									
					1955.536	5.94E-06	1783.67	9.44	25.85	0.16									
					1955.522	6.14E-06	1783.59	9.57	24.31	0.14									
					1955.508	6.08E-06	1783.5	9.59	24.08	0.12									
					1955.494	6.06E-06	1783.42	9.5	25.11	0.11									
					1955.48	5.65E-06	1783.34	9.44	25.88	0.09									
					1955.465	5.56E-06	1783.25	9.43	25.98	0.08									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1728.75	-0.61	-6.48							
													1728.65	-0.23	-6.26							
													1728.55	0.05	-5.79							
													1728.45	0.36	-5.52							
													1728.35	0.25	-5.54							
													1728.25	0.64	-5.51							
													1728.15	0.28	-5.82							
													1728.05	-0.39	-6.1							
													1727.95	-0.24	-6.02							
													1727.75	-0.11	-6.06							
													1727.61	-0.04	-5.97							
													1727.46	-0.22	-5.64							
													1727.32	0.1	-5.51							
													1727.18	0.05	-5.47							
													1727.04	-0.06	-5.74							
													1726.89	-0.14	-5.76							
													1726.75	-0.45	-5.89							
													1726.63	-0.06	-5.84							
													1726.5	-0.13	-5.52							
													1726.38	-0.29	-5.25							
													1726.25	-0.27	-5.45							
													1726.13	-0.53	-5.57							
													1726	-0.61	-5.92							
													1725.75	-0.46	-5.93							
													1725.63	-0.39	-5.69							
													1725.5	-0.21	-5.76							
													1725.38	-0.07	-5.55							
													1725.25	0.34	-5.24							
													1725.13	0.39	-5.15							
													1725	-0.02	-5.17							
													1724.75	0.42	-5.34							
													1724.63	0.29	-5.15							
													1724.5	0.56	-4.9							
													1724.38	0.13	-5.38							
													1724.25	-0.1	-5.21							
													1724.13	-0.12	-5							
													1724	1.13	-5.44							
													1723.75	0	-5.79							
													1723.64	0.38	-5.54							
													1723.53	0.88	-4.98							
													1723.42	0.59	-5.06							
													1723.31	1.24	-4.92							
													1723.19	1.25	-5.39							
													1723.08	0.42	-5.76							
													1722.97	-0.23	-5.96							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1955.451	5.45E-06	1783.17	9.33	27.19	0.07									
					1955.437	5.47E-06	1783.09	9.36	26.79	0.05									
					1955.423	5.68E-06	1783	9.43	25.92	0.04									
					1955.409	6.29E-06	1782.92	9.46	25.58	0.03									
					1955.395	6.36E-06	1782.84	9.49	25.29	0.02									
					1955.381	6.98E-06	1782.75	9.55	24.46	0.01									
					1955.367	8.59E-06	1782.67	9.62	23.67	0									
					1955.353	8.76E-06	1782.59	9.59	24.07	0									
					1955.339	8.82E-06	1782.5	9.56	24.39	-0.01									
					1955.325	7.46E-06	1782.42	9.5	25.13	-0.01									
					1955.311	7.65E-06	1782.34	9.43	25.99	-0.01									
					1955.296	7.14E-06	1782.25	9.39	26.42	-0.02									
					1955.282	5.9E-06	1782.17	9.33	27.19	-0.02									
					1955.268	5.48E-06	1782.09	9.36	26.85	-0.02									
					1955.254	5.51E-06	1782	9.37	26.71	-0.02									
					1955.24	4.84E-06	1781.92	9.4	26.34	-0.01									
					1955.226	4.93E-06	1781.84	9.44	25.89	-0.01									
					1955.212	5.74E-06	1781.75	9.47	25.5	-0.01									
					1955.198	4.83E-06	1781.67	9.49	25.25	-0.01									
					1955.184	4.62E-06	1781.59	9.54	24.68	0									
					1955.17	4.77E-06	1781.5	9.52	24.87	0									
					1955.156	4.31E-06	1781.42	9.55	24.52	0.01									
					1955.142	4.22E-06	1781.34	9.55	24.52	0.02									
					1955.127	4.17E-06	1781.25	9.39	26.5	0.02									
					1955.113	4.58E-06	1781.17	9.32	27.31	0.03									
					1955.099	4.64E-06	1781.09	9.35	26.95	0.04									
					1955.085	4.49E-06	1781	9.37	26.72	0.04									
					1955.071	4.3E-06	1780.92	9.38	26.58	0.05									
					1955.057	4.23E-06	1780.84	9.35	26.93	0.06									
					1955.043	4.11E-06	1780.75	9.4	26.39	0.07									
					1955.029	4.43E-06	1780.67	9.48	25.37	0.08									
					1955.015	4.51E-06	1780.59	9.55	24.57	0.09									
					1955.001	4.3E-06	1780.5	9.52	24.91	0.09									
					1954.987	4.16E-06	1780.42	9.51	25	0.1									
					1954.973	4.17E-06	1780.34	9.4	26.31	0.11									
					1954.958	4.11E-06	1780.25	9.33	27.14	0.12									
					1954.944	4.1E-06	1780.17	9.32	27.31	0.13									
					1954.93	4.05E-06	1780.09	9.35	26.91	0.14									
					1954.916	4.05E-06	1780	9.38	26.56	0.14									
					1954.902	3.97E-06	1779.92	9.49	25.27	0.15									
					1954.888	4.14E-06	1779.84	9.56	24.42	0.16									
					1954.874	3.97E-06	1779.75	9.55	24.5	0.17									
					1954.86	4.21E-06	1779.67	9.57	24.34	0.17									
					1954.846	4.5E-06	1779.59	9.49	25.26	0.18									
					1954.832	4.38E-06	1779.5	9.4	26.29	0.19									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1722.75	0.36	-5.99							
													1722.61	0.78	-5.6							
													1722.46	0.91	-5.27							
													1722.32	1.57	-4.95							
													1722.18	1.64	-5.21							
													1722.04	0.52	-5.97							
													1721.75	0.1	-6.05							
													1721.63	0.82	-5.55							
													1721.5	0.99	-5.14							
													1721.38	1.07	-4.96							
													1721.25	1.29	-5.42							
													1721.13	0.25	-5.85							
													1721	-0.09	-5.79							
													1720.75	0.13	-6							
													1720.61	0.45	-5.82							
													1720.46	0.72	-5.38							
													1720.32	0.94	-5.45							
													1720.18	1.42	-5.39							
													1720.04	-0.45	-6.04							
													1719.75	-0.51	-6.04							
													1719.65	-0.23	-5.85							
													1719.55	0.42	-5.54							
													1719.45	0.11	-5.52							
													1719.35	0.52	-5.54							
													1719.25	-0.46	-5.48							
													1719.15	0.13	-5.47							
													1719.05	0.3	-5.73							
													1718.95	0.42	-5.89							
													1718.75	0.17	-6.08							
													1718.64	0.67	-5.92							
													1718.53	0.33	-6.01							
													1718.42	0.97	-5.19							
													1718.31	1.28	-5.03							
													1718.19	1.11	-5.58							
													1718.08	0.77	-5.87							
													1717.97	0.81	-5.97							
													1717.75	0.43	-6.08							
													1717.61	0.34	-5.6							
													1717.46	0.3	-5.41							
													1717.32	1.08	-5.23							
													1717.18	0.96	-5.42							
													1717.04	0.85	-5.6							
													1716.75	0.34	-6.03							
													1716.67	0.02	-5.95							
													1716.58	-0.1	-5.5							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1954.818	4.56E-06	1779.42	9.37	26.66	0.19									
					1954.804	4.78E-06	1779.34	9.29	27.67	0.2									
					1954.789	4.72E-06	1779.25	9.29	27.62	0.21									
					1954.775	4.43E-06	1779.17	9.28	27.8	0.21									
					1954.761	4.52E-06	1779.09	9.34	27.06	0.21									
					1954.747	4.37E-06	1779	9.35	26.89	0.22									
					1954.733	4.54E-06	1778.92	9.41	26.25	0.22									
					1954.719	4.47E-06	1778.84	9.44	25.8	0.22									
					1954.705	4.26E-06	1778.75	9.47	25.46	0.22									
					1954.691	4.33E-06	1778.67	9.48	25.37	0.22									
					1954.677	4.65E-06	1778.59	9.49	25.26	0.22									
					1954.663	4.66E-06	1778.5	9.46	25.65	0.22									
					1954.649	4.92E-06	1778.42	9.43	25.94	0.22									
					1954.635	5.15E-06	1778.34	9.38	26.55	0.21									
					1954.62	5.12E-06	1778.25	9.3	27.51	0.21									
					1954.606	5.32E-06	1778.17	9.28	27.8	0.21									
					1954.592	4.91E-06	1778.09	9.33	27.2	0.2									
					1954.578	4.99E-06	1778	9.32	27.27	0.2									
					1954.564	4.95E-06	1777.92	9.39	26.52	0.19									
					1954.55	5.08E-06	1777.84	9.47	25.43	0.18									
					1954.536	5.22E-06	1777.75	9.5	25.1	0.18									
					1954.522	5.34E-06	1777.67	9.49	25.31	0.17									
					1954.508	0.000005	1777.59	9.47	25.43	0.16									
					1954.494	4.75E-06	1777.5	9.44	25.84	0.16									
					1954.481	4.55E-06	1777.42	9.5	25.14	0.15									
					1954.467	4.53E-06	1777.34	9.51	25.05	0.14									
					1954.453	4.95E-06	1777.25	9.39	26.44	0.13									
					1954.439	5.37E-06	1777.17	9.34	27.07	0.13									
					1954.425	5.43E-06	1777.09	9.37	26.7	0.12									
					1954.411	5.92E-06	1777	9.4	26.3	0.11									
					1954.397	6.34E-06	1776.92	9.44	25.91	0.1									
					1954.383	5.8E-06	1776.84	9.46	25.63	0.1									
					1954.369	6.63E-06	1776.75	9.52	24.93	0.09									
					1954.356	7.59E-06	1776.67	9.55	24.47	0.08									
					1954.342	7.97E-06	1776.59	9.57	24.25	0.08									
					1954.328	8.57E-06	1776.5	9.58	24.16	0.07									
					1954.314	8.37E-06	1776.42	9.53	24.77	0.07									
					1954.3	8.68E-06	1776.34	9.44	25.89	0.06									
					1954.286	7.73E-06	1776.25	9.34	27.12	0.05									
					1954.272	5.13E-06	1776.17	9.26	28.04	0.05									
					1954.258	4.42E-06	1776.09	9.28	27.83	0.04									
					1954.244	4.07E-06	1776	9.33	27.16	0.04									
					1954.231	4.06E-06	1775.92	9.45	25.78	0.03									
					1954.217	3.86E-06	1775.84	9.49	25.26	0.03									
					1954.203	4.02E-06	1775.75	9.51	25.04	0.02									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1716.5	-0.21	-5.01							
													1716.42	0.47	-5.07							
													1716.33	0.2	-4.9							
													1716.25	0.01	-4.76							
													1716.17	0.84	-5.4							
													1716.08	0.78	-5.34							
													1716	0.34	-5.69							
													1715.92	0.38	-6.03							
													1715.75	-0.01	-6.15							
													1715.64	0.17	-5.58							
													1715.53	0.44	-5.33							
													1715.42	0.74	-5.13							
													1715.31	0.11	-5.31							
													1715.19	-0.12	-5.64							
													1715.08	-0.25	-5.92							
													1714.97	-0.31	-5.98							
													1714.75	0.14	-6.01							
													1714.64	0.4	-5.7							
													1714.53	0.66	-5.37							
													1714.42	1.48	-4.89							
													1714.31	0.69	-5.42							
													1714.19	0.95	-5.37							
													1714.08	0.54	-5.78							
													1713.97	0.39	-5.67							
													1713.75	0.62	-5.75							
													1713.64	0.91	-5.4							
													1713.53	1.25	-5.04							
													1713.42	0.93	-5.25							
													1713.31	1.28	-5.33							
													1713.19	1.2	-5.77							
													1713.08	1.21	-5.68							
													1712.97	0.5	-5.93							
													1712.75	-0.35	-6.29							
													1712.63	0.16	-5.96							
													1712.5	0.12	-5.72							
													1712.38	0.77	-5.35							
													1712.25	0.89	-5.31							
													1712.13	0.48	-5.41							
													1712	-0.21	-5.87							
													1711.75	-0.82	-6.35							
													1711.65	0.03	-5.79							
													1711.55	-0.18	-5.79							
													1711.45	-0.04	-5.6							
													1711.35	0.18	-5.28							
													1711.25	0.1	-5.54							

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1954.189	3.82E-06	1775.67	9.57	24.29	0.02									
					1954.175	3.75E-06	1775.59	9.56	24.42	0.01									
					1954.161	3.81E-06	1775.5	9.5	25.1	0.01									
					1954.147	3.7E-06	1775.42	9.45	25.77	0									
					1954.133	3.84E-06	1775.34	9.4	26.32	0									
					1954.119	4.24E-06	1775.25	9.37	26.7	0									
					1954.106	3.8E-06	1775.17	9.33	27.19	-0.01									
					1954.092	4.08E-06	1775.09	9.37	26.69	-0.01									
					1954.078	4.16E-06	1775	9.43	26	-0.02									
					1954.064	4.1E-06	1774.92	9.48	25.37	-0.02									
					1954.05	4.16E-06	1774.84	9.5	25.15	-0.03									
					1954.036	4.28E-06	1774.75	9.54	24.62	-0.03									
					1954.022	4.45E-06	1774.67	9.48	25.37	-0.04									
					1954.008	4.31E-06	1774.59	9.42	26.08	-0.04									
					1953.994	4.29E-06	1774.5	9.36	26.83	-0.05									
					1953.981	4.58E-06	1774.42	9.34	27.07	-0.06									
					1953.967	4.65E-06	1774.34	9.33	27.19	-0.06									
					1953.953	4.25E-06	1774.25	9.34	27.12	-0.07									
					1953.939	4.28E-06	1774.17	9.33	27.19	-0.08									
					1953.925	3.99E-06	1774.09	9.41	26.19	-0.08									
					1953.911	4.13E-06	1774	9.53	24.81	-0.09									
					1953.897	4.12E-06	1773.92	9.54	24.59	-0.1									
					1953.883	4.18E-06	1773.84	9.52	24.88	-0.1									
					1953.869	4.28E-06	1773.75	9.43	26.03	-0.11									
					1953.856	4.2E-06	1773.67	9.43	25.98	-0.11									
					1953.842	4.1E-06	1773.59	9.51	24.98	-0.12									
					1953.828	4.05E-06	1773.5	9.62	23.71	-0.13									
					1953.814	4.25E-06	1773.42	9.61	23.76	-0.13									
					1953.8	4.54E-06	1773.34	9.53	24.71	-0.14									
					1953.786	4.8E-06	1773.25	9.36	26.84	-0.14									
					1953.772	4.62E-06	1773.17	9.31	27.43	-0.15									
					1953.758	4.96E-06	1773.09	9.33	27.21	-0.15									
					1953.744	5.4E-06	1773	9.43	26.03	-0.16									
					1953.731	5.75E-06	1772.92	9.46	25.61	-0.16									
					1953.717	5.48E-06	1772.84	9.51	25.05	-0.17									
					1953.703	5.68E-06	1772.75	9.52	24.89	-0.17									
					1953.689	5.63E-06	1772.67	9.58	24.15	-0.17									
					1953.675	5.5E-06	1772.59	9.59	24.04	-0.18									
					1953.661	5.47E-06	1772.5	9.59	24.03	-0.18									
					1953.647	5.54E-06	1772.42	9.53	24.76	-0.19									
					1953.633	5.38E-06	1772.34	9.41	26.22	-0.19									
					1953.619	5.16E-06	1772.25	9.36	26.81	-0.19									
					1953.606	5.09E-06	1772.17	9.33	27.19	-0.2									
					1953.592	5.13E-06	1772.09	9.35	26.97	-0.2									
					1953.578	5.06E-06	1772	9.35	26.95	-0.21									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year
													1711.15	0.65	-5.41							
													1711.05	-0.45	-6.17							
													1710.95	-0.14	-5.78							
													1710.75	-0.25	-6.05							
													1710.67	-0.19	-5.91							
													1710.6	-0.33	-5.76							
													1710.52	-0.11	-5.42							
													1710.44	0.29	-5.36							
													1710.37	0.61	-5.54							
													1710.29	-0.75	-5.5							
													1710.21	1.18	-5.5							
													1710.13	0.14	-5.43							
													1710.06	-0.51	-5.77							
													1709.98	-0.42	-5.64							
													1709.9	-0.76	-5.75							
													1709.75	-0.48	-6.01							
													1709.64	-0.08	-5.68							
													1709.53	-0.42	-5.79							
													1709.42	1.12	-5.5							
													1709.31	0.6	-5.4							
													1709.19	0.2	-5.3							
													1709.08	-0.15	-5.64							
													1708.97	-0.28	-5.64							
													1708.75	0.1	-5.7							
													1708.63	0.43	-5.7							
													1708.5	-0.46	-5.63							
													1708.38	-0.05	-5.1							
													1708.25	0.17	-5.09							
													1708.13	-0.09	-5.09							
													1708	-0.52	-5.74							
													1707.75	-0.66	-5.78							

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1953.564	5.08E-06	1771.92	9.37	26.7	-0.21									
					1953.55	4.97E-06	1771.84	9.43	26.01	-0.22									
					1953.535	5.05E-06	1771.75	9.46	25.61	-0.22									
					1953.521	4.8E-06	1771.67	9.48	25.34	-0.23									
					1953.506	0.000005	1771.59	9.52	24.87	-0.23									
					1953.491	5.39E-06	1771.5	9.51	25.04	-0.24									
					1953.476	5.44E-06	1771.42	9.42	26.14	-0.25									
					1953.462	5.43E-06	1771.34	9.37	26.69	-0.25									
					1953.447	5.14E-06	1771.25	9.38	26.61	-0.26									
					1953.432	4.72E-06	1771.17	9.35	26.95	-0.27									
					1953.418	5.36E-06	1771.09	9.35	26.95	-0.28									
					1953.403	5.33E-06	1771	9.41	26.25	-0.28									
					1953.388	5.46E-06	1770.92	9.5	25.12	-0.29									
					1953.374	5.58E-06	1770.84	9.55	24.56	-0.3									
					1953.359	0.000006	1770.75	9.57	24.28	-0.31									
					1953.344	6.17E-06	1770.67	9.63	23.55	-0.31									
					1953.329	5.81E-06	1770.59	9.6	23.88	-0.32									
					1953.315	6.02E-06	1770.5	9.48	25.42	-0.33									
					1953.3	5.94E-06	1770.42	9.49	25.25	-0.33									
					1953.285	5.76E-06	1770.34	9.35	26.93	-0.34									
					1953.271	6.4E-06	1770.25	9.37	26.72	-0.35									
					1953.256	6.98E-06	1770.17	9.35	26.95	-0.35									
					1953.241	7.47E-06	1770.09	9.51	25.06	-0.36									
					1953.226	6.83E-06	1770	9.62	23.62	-0.36									
					1953.212	5.28E-06	1769.92	9.59	23.98	-0.37									
					1953.197	0.000005	1769.84	9.57	24.23	-0.37									
					1953.182	4.91E-06	1769.75	9.56	24.37	-0.37									
					1953.168	4.11E-06	1769.67	9.5	25.13	-0.38									
					1953.153	3.99E-06	1769.59	9.44	25.91	-0.38									
					1953.138	3.88E-06	1769.5	9.41	26.25	-0.38									
					1953.124	3.91E-06	1769.42	9.37	26.7	-0.39									
					1953.109	3.83E-06	1769.34	9.32	27.35	-0.39									
					1953.094	3.77E-06	1769.25	9.3	27.56	-0.39									
					1953.079	3.85E-06	1769.17	9.3	27.55	-0.39									
					1953.065	3.66E-06	1769.09	9.36	26.8	-0.39									
					1953.05	3.75E-06	1769	9.42	26.11	-0.4									
					1953.035	3.84E-06	1768.92	9.52	24.85	-0.4									
					1953.021	4.53E-06	1768.84	9.59	23.98	-0.4									
					1953.006	4.29E-06	1768.75	9.65	23.35	-0.4									
					1952.991	3.86E-06	1768.67	9.6	23.91	-0.4									
					1952.976	3.87E-06	1768.59	9.64	23.47	-0.39									
					1952.962	3.87E-06	1768.5	9.54	24.69	-0.39									
					1952.947	3.94E-06	1768.42	9.46	25.63	-0.39									
					1952.932	3.74E-06	1768.34	9.4	26.28	-0.38									
					1952.918	3.77E-06	1768.25	9.38	26.62	-0.38									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1952.903	3.84E-06	1768.17	9.34	27.07	-0.37									
					1952.888	3.85E-06	1768.09	9.41	26.21	-0.37									
					1952.874	3.85E-06	1768	9.45	25.77	-0.36									
					1952.859	3.83E-06	1767.92	9.38	26.58	-0.35									
					1952.844	3.77E-06	1767.84	9.43	25.92	-0.34									
					1952.829	3.83E-06	1767.75	9.54	24.58	-0.33									
					1952.815	3.81E-06	1767.67	9.57	24.29	-0.32									
					1952.8	3.7E-06	1767.59	9.59	24.07	-0.31									
					1952.785	3.81E-06	1767.5	9.58	24.15	-0.29									
					1952.771	4.26E-06	1767.42	9.51	25.02	-0.28									
					1952.756	4.12E-06	1767.34	9.42	26.08	-0.26									
					1952.741	4.73E-06	1767.25	9.36	26.79	-0.24									
					1952.726	4.07E-06	1767.17	9.32	27.31	-0.23									
					1952.712	0.000004	1767.09	9.32	27.31	-0.21									
					1952.697	4.12E-06	1767	9.43	26.01	-0.19									
					1952.682	3.94E-06	1766.92	9.5	25.12	-0.16									
					1952.668	4.08E-06	1766.84	9.56	24.45	-0.14									
					1952.653	4.2E-06	1766.75	9.57	24.28	-0.11									
					1952.638	4.14E-06	1766.67	9.56	24.4	-0.09									
					1952.624	4.06E-06	1766.59	9.57	24.22	-0.06									
					1952.609	4.1E-06	1766.5	9.59	24.09	-0.03									
					1952.594	4.4E-06	1766.42	9.52	24.84	0									
					1952.579	4.18E-06	1766.34	9.43	26.01	0.04									
					1952.565	4.18E-06	1766.25	9.41	26.26	0.07									
					1952.55	4.23E-06	1766.17	9.36	26.83	0.11									
					1952.533	4.3E-06	1766.09	9.39	26.43	0.14									
					1952.517	4.28E-06	1766	9.47	25.53	0.18									
					1952.5	4.42E-06	1765.92	9.55	24.55	0.22									
					1952.483	4.33E-06	1765.84	9.6	23.95	0.26									
					1952.467	4.23E-06	1765.75	9.59	24.08	0.3									
					1952.45	4.86E-06	1765.67	9.53	24.76	0.34									
					1952.433	4.28E-06	1765.59	9.47	25.43	0.38									
					1952.417	4.29E-06	1765.5	9.43	25.99	0.43									
					1952.4	4.28E-06	1765.42	9.37	26.69	0.47									
					1952.383	4.34E-06	1765.34	9.36	26.83	0.51									
					1952.367	4.5E-06	1765.25	9.33	27.23	0.56									
					1952.35	4.09E-06	1765.17	9.29	27.68	0.6									
					1952.333	4.23E-06	1765.09	9.38	26.56	0.64									
					1952.317	4.09E-06	1765	9.41	26.18	0.68									
					1952.3	4.31E-06	1764.92	9.42	26.1	0.72									
					1952.283	4.42E-06	1764.84	9.41	26.26	0.76									
					1952.267	4.32E-06	1764.75	9.37	26.75	0.8									
					1952.25	4.41E-06	1764.67	9.3	27.56	0.84									
					1952.233	4.48E-06	1764.59	9.27	27.96	0.87									
					1952.217	4.47E-06	1764.5	9.26	28.04	0.91									

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1952.2	4.49E-06	1764.42	9.24	28.28	0.94									
					1952.183	4.42E-06	1764.34	9.23	28.45	0.97									
					1952.167	4.61E-06	1764.25	9.23	28.39	1									
					1952.15	4.46E-06	1764.17	9.19	28.89	1.02									
					1952.133	4.6E-06	1764.09	9.25	28.18	1.04									
					1952.117	4.58E-06	1764	9.33	27.15	1.07									
					1952.1	4.57E-06	1763.92	9.37	26.77	1.08									
					1952.083	4.44E-06	1763.84	9.38	26.58	1.1									
					1952.067	4.6E-06	1763.75	9.41	26.2	1.12									
					1952.05	4.46E-06	1763.67	9.37	26.7	1.13									
					1952.033	4.52E-06	1763.59	9.26	28.02	1.14									
					1952.017	4.36E-06	1763.5	9.25	28.12	1.15									
					1952	4.21E-06	1763.42	9.26	28.04	1.15									
					1951.983	4.27E-06	1763.34	9.26	28.08	1.16									
					1951.967	4.11E-06	1763.25	9.25	28.2	1.16									
					1951.95	4.16E-06	1763.17	9.23	28.41	1.16									
					1951.933	3.87E-06	1763.09	9.26	28.04	1.16									
					1951.917	3.93E-06	1763	9.31	27.4	1.16									
					1951.9	4.17E-06	1762.92	9.37	26.65	1.15									
					1951.883	3.9E-06	1762.84	9.44	25.91	1.15									
					1951.867	3.98E-06	1762.75	9.45	25.68	1.14									
					1951.85	3.77E-06	1762.67	9.48	25.33	1.13									
					1951.833	3.72E-06	1762.59	9.48	25.36	1.13									
					1951.817	3.83E-06	1762.5	9.37	26.65	1.12									
					1951.8	3.67E-06	1762.42	9.34	27.06	1.1									
					1951.783	3.89E-06	1762.34	9.31	27.49	1.09									
					1951.767	3.84E-06	1762.25	9.28	27.86	1.08									
					1951.75	3.97E-06	1762.17	9.26	28.04	1.07									
					1951.733	3.96E-06	1762.09	9.28	27.82	1.06									
					1951.717	3.77E-06	1762	9.27	27.89	1.04									
					1951.7	3.9E-06	1761.92	9.32	27.35	1.03									
					1951.683	3.78E-06	1761.84	9.38	26.56	1.01									
					1951.667	3.8E-06	1761.75	9.43	25.97	1									
					1951.65	4.06E-06	1761.67	9.45	25.68	0.98									
					1951.633	4.21E-06	1761.59	9.43	26.02	0.97									
					1951.617	4.25E-06	1761.5	9.35	26.96	0.95									
					1951.6	4.15E-06	1761.42	9.28	27.77	0.94									
					1951.583	4.29E-06	1761.34	9.22	28.53	0.92									
					1951.567	4.27E-06	1761.25	9.22	28.54	0.91									
					1951.55	4.71E-06	1761.17	9.21	28.65	0.89									
					1951.536	5.15E-06	1761.09	9.45	25.77	0.88									
					1951.521	5.04E-06	1761	9.58	24.15	0.87									
					1951.507	5.11E-06	1760.92	9.58	24.15	0.86									
					1951.493	5.5E-06	1760.84	9.55	24.46	0.85									
					1951.479	5.56E-06	1760.75	9.53	24.79	0.84									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003		Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1951.464	5.55E-06	1760.67	9.5	25.13	0.83									
					1951.45	5.39E-06	1760.59	9.46	25.67	0.82									
					1951.436	5.72E-06	1760.5	9.41	26.24	0.82									
					1951.421	5.6E-06	1760.42	9.36	26.83	0.81									
					1951.407	5.63E-06	1760.34	9.33	27.22	0.81									
					1951.393	5.49E-06	1760.25	9.31	27.47	0.81									
					1951.379	5.55E-06	1760.17	9.3	27.56	0.8									
					1951.364	5.72E-06	1760.09	9.31	27.43	0.8									
					1951.35	6.16E-06	1760	9.33	27.2	0.8									
					1951.336	6.11E-06	1759.92	9.39	26.51	0.81									
					1951.321	5.78E-06	1759.84	9.4	26.36	0.81									
					1951.307	5.93E-06	1759.75	9.43	26.02	0.81									
					1951.293	5.6E-06	1759.67	9.43	25.98	0.82									
					1951.279	5.52E-06	1759.59	9.45	25.69	0.82									
					1951.264	5.67E-06	1759.5	9.46	25.58	0.83									
					1951.25	5.5E-06	1759.42	9.41	26.22	0.84									
					1951.236	5.49E-06	1759.34	9.34	27.08	0.85									
					1951.221	5.95E-06	1759.25	9.31	27.41	0.86									
					1951.207	5.83E-06	1759.17	9.24	28.28	0.87									
					1951.193	5.91E-06	1759.09	9.31	27.38	0.88									
					1951.179	5.88E-06	1759	9.33	27.2	0.89									
					1951.164	5.97E-06	1758.92	9.35	26.95	0.9									
					1951.15	5.8E-06	1758.84	9.36	26.84	0.92									
					1951.136	5.96E-06	1758.75	9.45	25.78	0.93									
					1951.121	5.57E-06	1758.67	9.46	25.61	0.95									
					1951.107	6.16E-06	1758.59	9.5	25.16	0.96									
					1951.093	7.27E-06	1758.5	9.44	25.82	0.98									
					1951.079	6.6E-06	1758.42	9.32	27.31	1									
					1951.064	7.16E-06	1758.34	9.48	25.4	1.01									
					1951.05	7.31E-06	1758.25	9.33	27.23	1.03									
					1951.036	7.44E-06	1758.17	9.22	28.53	1.05									
					1951.021	7.73E-06	1758.09	9.23	28.41	1.07									
					1951.007	7.4E-06	1758	9.31	27.38	1.09									
					1950.993	8.05E-06	1757.92	9.36	26.83	1.11									
					1950.979	7.29E-06	1757.84	9.38	26.56	1.13									
					1950.964	7.16E-06	1757.75	9.4	26.4	1.15									
					1950.95	5.8E-06	1757.67	9.41	26.23	1.17									
					1950.936	5.73E-06	1757.59	9.42	26.14	1.19									
					1950.921	5.53E-06	1757.5	9.39	26.43	1.21									
					1950.907	5.34E-06	1757.42	9.33	27.19	1.23									
					1950.893	5.37E-06	1757.34	9.26	28.08	1.25									
					1950.879	5.08E-06	1757.25	9.24	28.31	1.27									
					1950.864	5.21E-06	1757.17	9.21	28.65	1.29									
					1950.85	5.02E-06	1757.09	9.22	28.54	1.31									
					1950.836	4.95E-06	1757	9.25	28.15	1.33									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1950.821	4.71E-06	1756.92	9.28	27.8	1.35									
					1950.807	4.82E-06	1756.84	9.34	27.03	1.36									
					1950.793	4.67E-06	1756.75	9.42	26.14	1.38									
					1950.779	4.49E-06	1756.67	9.45	25.79	1.4									
					1950.764	4.53E-06	1756.59	9.45	25.67	1.42									
					1950.75	4.63E-06	1756.5	9.46	25.58	1.43									
					1950.736	4.12E-06	1756.42	9.39	26.5	1.45									
					1950.721	3.78E-06	1756.34	9.27	27.97	1.47									
					1950.707	3.63E-06	1756.25	9.24	28.32	1.48									
					1950.693	3.67E-06	1756.17	9.2	28.77	1.5									
					1950.679	4.11E-06	1756.09	9.21	28.69	1.51									
					1950.664	4.16E-06	1756	9.24	28.23	1.53									
					1950.65	4.28E-06	1755.92	9.29	27.73	1.54									
					1950.636	4.44E-06	1755.84	9.34	27.09	1.55									
					1950.621	4.87E-06	1755.75	9.37	26.65	1.57									
					1950.607	5.33E-06	1755.67	9.38	26.58	1.58									
					1950.593	5.31E-06	1755.59	9.34	27.07	1.59									
					1950.579	5.33E-06	1755.5	9.28	27.76	1.6									
					1950.564	5.19E-06	1755.42	9.22	28.51	1.61									
					1950.55	5.07E-06	1755.34	9.18	29.06	1.62									
					1950.536	4.96E-06	1755.25	9.18	29.01	1.63									
					1950.521	5.23E-06	1755.17	9.23	28.41	1.63									
					1950.507	5.25E-06	1755.09	9.26	28.02	1.64									
					1950.492	5.04E-06	1755	9.29	27.69	1.64									
					1950.478	5.03E-06	1754.92	9.31	27.43	1.65									
					1950.463	5.24E-06	1754.84	9.35	26.89	1.65									
					1950.449	5.1E-06	1754.75	9.39	26.51	1.66									
					1950.434	5.2E-06	1754.67	9.4	26.34	1.66									
					1950.42	5.2E-06	1754.59	9.43	26.03	1.67									
					1950.405	5.3E-06	1754.5	9.4	26.34	1.67									
					1950.391	5.94E-06	1754.42	9.31	27.43	1.67									
					1950.376	5.65E-06	1754.34	9.27	27.98	1.68									
					1950.362	7.16E-06	1754.25	9.23	28.36	1.68									
					1950.347	7.25E-06	1754.17	9.22	28.53	1.68									
					1950.333	7.59E-06	1754.09	9.23	28.43	1.68									
					1950.318	7.6E-06	1754	9.23	28.41	1.68									
					1950.304	9.15E-06	1753.92	9.25	28.22	1.68									
					1950.289	0.000009	1753.84	9.28	27.84	1.69									
					1950.275	7.74E-06	1753.75	9.32	27.33	1.69									
					1950.26	8.09E-06	1753.67	9.36	26.83	1.69									
					1950.246	6.98E-06	1753.59	9.4	26.32	1.69									
					1950.231	6.43E-06	1753.5	9.44	25.89	1.69									
					1950.217	6.03E-06	1753.42	9.42	26.1	1.69									
					1950.202	5.73E-06	1753.34	9.35	26.95	1.69									
					1950.188	5.09E-06	1753.25	9.25	28.1	1.69									

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1950.173	4.42E-06	1753.17	9.18	29.01	1.69									
					1950.159	4.41E-06	1753.09	9.22	28.5	1.69									
					1950.144	4.42E-06	1753	9.27	27.94	1.69									
					1950.13	4.26E-06	1752.92	9.26	28.01	1.69									
					1950.115	4.34E-06	1752.84	9.32	27.31	1.69									
					1950.101	4.48E-06	1752.75	9.39	26.52	1.69									
					1950.086	4.29E-06	1752.67	9.42	26.16	1.69									
					1950.072	4.14E-06	1752.59	9.4	26.36	1.69									
					1950.057	4.08E-06	1752.5	9.37	26.72	1.69									
					1950.043	4.31E-06	1752.42	9.3	27.61	1.69									
					1950.028	4.31E-06	1752.34	9.25	28.11	1.69									
					1950.014	4.16E-06	1752.25	9.2	28.77	1.69									
					1949.999	4.1E-06	1752.17	9.18	29.01	1.69									
					1949.985	4.08E-06	1752.09	9.23	28.45	1.69									
					1949.97	4.09E-06	1752	9.28	27.85	1.69									
					1949.956	4.12E-06	1751.92	9.31	27.43	1.69									
					1949.941	4.24E-06	1751.84	9.33	27.17	1.69									
					1949.927	4.13E-06	1751.75	9.36	26.88	1.69									
					1949.912	4.01E-06	1751.67	9.37	26.7	1.69									
					1949.898	4.14E-06	1751.59	9.35	26.93	1.69									
					1949.883	4.31E-06	1751.5	9.31	27.46	1.68									
					1949.869	4.31E-06	1751.42	9.27	27.93	1.68									
					1949.854	4.25E-06	1751.34	9.23	28.44	1.68									
					1949.84	4.1E-06	1751.25	9.21	28.66	1.68									
					1949.825	4.08E-06	1751.17	9.2	28.77	1.68									
					1949.811	3.99E-06	1751.09	9.23	28.41	1.67									
					1949.796	4.16E-06	1751	9.26	28.06	1.67									
					1949.782	3.98E-06	1750.92	9.27	27.87	1.67									
					1949.767	3.69E-06	1750.84	9.29	27.69	1.67									
					1949.753	3.62E-06	1750.75	9.32	27.33	1.66									
					1949.738	3.72E-06	1750.67	9.35	26.95	1.66									
					1949.724	3.65E-06	1750.59	9.35	27.01	1.66									
					1949.709	3.74E-06	1750.5	9.34	27.07	1.66									
					1949.695	3.56E-06	1750.42	9.35	26.95	1.66									
					1949.68	4.18E-06	1750.34	9.36	26.84	1.66									
					1949.666	3.85E-06	1750.25	9.31	27.47	1.66									
					1949.651	3.97E-06	1750.17	9.25	28.16	1.66									
					1949.637	3.93E-06	1750.09	9.35	26.92	1.66									
					1949.622	3.98E-06	1750	9.37	26.73	1.66									
					1949.608	4.03E-06	1749.92	9.38	26.54	1.66									
					1949.593	4.1E-06	1749.84	9.4	26.39	1.66									
					1949.579	4.49E-06	1749.75	9.41	26.28	1.66									
					1949.564	4.64E-06	1749.67	9.4	26.38	1.67									
					1949.55	4.34E-06	1749.59	9.36	26.81	1.67									
					1949.533	4.66E-06	1749.5	9.32	27.33	1.67									

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1949.516	4.53E-06	1749.42	9.28	27.76	1.68									
					1949.499	4.74E-06	1749.34	9.25	28.11	1.68									
					1949.481	4.64E-06	1749.25	9.22	28.55	1.69									
					1949.464	4.81E-06	1749.17	9.2	28.77	1.69									
					1949.447	4.71E-06	1749.09	9.23	28.38	1.7									
					1949.43	5.01E-06	1749	9.27	27.98	1.7									
					1949.413	4.95E-06	1748.92	9.3	27.55	1.71									
					1949.396	5.12E-06	1748.84	9.35	26.93	1.71									
					1949.378	5.05E-06	1748.75	9.39	26.51	1.72									
					1949.361	4.79E-06	1748.67	9.4	26.34	1.73									
					1949.344	4.63E-06	1748.59	9.36	26.89	1.73									
					1949.327	4.63E-06	1748.5	9.34	27.08	1.74									
					1949.31	0.000005	1748.42	9.36	26.83	1.74									
					1949.293	4.92E-06	1748.34	9.26	28.07	1.74									
					1949.276	5.22E-06	1748.25	9.19	28.92	1.75									
					1949.258	5.66E-06	1748.17	9.16	29.26	1.75									
					1949.241	5.86E-06	1748.09	9.18	29.05	1.76									
					1949.224	5.95E-06	1748	9.21	28.68	1.76									
					1949.207	5.42E-06	1747.92	9.23	28.46	1.76									
					1949.19	5.34E-06	1747.84	9.26	28.04	1.76									
					1949.173	6.1E-06	1747.75	9.3	27.55	1.76									
					1949.155	5.39E-06	1747.67	9.38	26.58	1.76									
					1949.138	5.53E-06	1747.59	9.43	26.02	1.76									
					1949.121	5.07E-06	1747.5	9.36	26.88	1.76									
					1949.104	5.61E-06	1747.42	9.31	27.38	1.76									
					1949.087	4.62E-06	1747.34	9.27	27.95	1.76									
					1949.07	4.77E-06	1747.25	9.2	28.73	1.76									
					1949.053	4.58E-06	1747.17	9.16	29.26	1.75									
					1949.035	4.57E-06	1747.09	9.18	29.02	1.75									
					1949.018	4.22E-06	1747	9.24	28.31	1.75									
					1949.001	4.04E-06	1746.92	9.29	27.69	1.74									
					1948.984	4.34E-06	1746.84	9.33	27.23	1.74									
					1948.967	4.28E-06	1746.75	9.35	26.9	1.73									
					1948.95	4.18E-06	1746.67	9.38	26.6	1.72									
					1948.932	4.32E-06	1746.59	9.31	27.39	1.72									
					1948.915	4.25E-06	1746.5	9.23	28.37	1.71									
					1948.898	4.36E-06	1746.42	9.22	28.51	1.71									
					1948.881	4.11E-06	1746.34	9.24	28.29	1.7									
					1948.864	4.15E-06	1746.25	9.24	28.32	1.69									
					1948.847	4.25E-06	1746.17	9.21	28.65	1.68									
					1948.829	4.15E-06	1746.09	9.27	27.91	1.68									
					1948.812	4.09E-06	1746	9.36	26.87	1.67									
					1948.795	4.14E-06	1745.92	9.43	25.95	1.66									
					1948.778	4.17E-06	1745.84	9.44	25.86	1.66									
					1948.761	3.97E-06	1745.75	9.44	25.85	1.65									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1948.744	4.14E-06	1745.67	9.4	26.3	1.65									
					1948.727	4.01E-06	1745.59	9.37	26.75	1.64									
					1948.709	4.18E-06	1745.5	9.39	26.47	1.64									
					1948.692	4.29E-06	1745.42	9.3	27.61	1.63									
					1948.675	4.19E-06	1745.34	9.24	28.34	1.63									
					1948.658	4.35E-06	1745.25	9.21	28.71	1.62									
					1948.641	4.43E-06	1745.17	9.19	28.89	1.62									
					1948.624	4.47E-06	1745.09	9.22	28.55	1.62									
					1948.606	4.45E-06	1745	9.23	28.41	1.61									
					1948.589	4.2E-06	1744.92	9.38	26.58	1.61									
					1948.572	4.34E-06	1744.84	9.48	25.35	1.61									
					1948.555	4.38E-06	1744.75	9.47	25.48	1.61									
					1948.537	4.35E-06	1744.67	9.41	26.22	1.61									
					1948.519	4.32E-06	1744.59	9.4	26.33	1.6									
					1948.5	4.32E-06	1744.5	9.41	26.22	1.6									
					1948.482	4.32E-06	1744.42	9.39	26.46	1.6									
					1948.464	4.41E-06	1744.34	9.32	27.36	1.6									
					1948.446	4.57E-06	1744.25	9.22	28.48	1.6									
					1948.428	4.5E-06	1744.17	9.14	29.5	1.6									
					1948.41	4.72E-06	1744.09	9.17	29.2	1.6									
					1948.391	4.67E-06	1744	9.2	28.8	1.6									
					1948.373	4.57E-06	1743.92	9.22	28.47	1.6									
					1948.355	4.47E-06	1743.84	9.23	28.41	1.6									
					1948.337	4.73E-06	1743.75	9.29	27.72	1.6									
					1948.319	4.83E-06	1743.67	9.33	27.19	1.59									
					1948.3	5.13E-06	1743.59	9.36	26.85	1.59									
					1948.282	4.95E-06	1743.5	9.35	26.89	1.59									
					1948.264	5.02E-06	1743.42	9.35	26.91	1.59									
					1948.246	4.97E-06	1743.34	9.29	27.64	1.58									
					1948.228	4.58E-06	1743.25	9.24	28.31	1.58									
					1948.21	4.45E-06	1743.17	9.22	28.53	1.58									
					1948.191	4.41E-06	1743.09	9.28	27.85	1.58									
					1948.173	4.49E-06	1743	9.27	27.91	1.57									
					1948.155	4.28E-06	1742.92	9.31	27.43	1.57									
					1948.137	4.29E-06	1742.84	9.35	26.98	1.57									
					1948.119	4.21E-06	1742.75	9.39	26.48	1.56									
					1948.1	4.03E-06	1742.67	9.42	26.1	1.56									
					1948.082	3.98E-06	1742.59	9.39	26.43	1.56									
					1948.064	4.06E-06	1742.5	9.36	26.81	1.55									
					1948.046	4.11E-06	1742.42	9.33	27.19	1.55									
					1948.028	4.06E-06	1742.34	9.27	27.98	1.55									
					1948.01	4.03E-06	1742.25	9.23	28.39	1.55									
					1947.991	3.98E-06	1742.17	9.21	28.65	1.54									
					1947.973	3.98E-06	1742.09	9.24	28.24	1.54									
					1947.955	3.96E-06	1742	9.26	27.98	1.54									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1947.937	3.86E-06	1741.92	9.3	27.54	1.54									
					1947.919	3.96E-06	1741.84	9.37	26.74	1.54									
					1947.9	3.93E-06	1741.75	9.41	26.17	1.53									
					1947.882	3.95E-06	1741.67	9.45	25.73	1.53									
					1947.864	4.26E-06	1741.59	9.45	25.77	1.53									
					1947.846	4.26E-06	1741.5	9.36	26.87	1.53									
					1947.828	4.08E-06	1741.42	9.25	28.11	1.53									
					1947.81	4.07E-06	1741.34	9.22	28.53	1.53									
					1947.791	4.24E-06	1741.25	9.22	28.53	1.53									
					1947.773	4.06E-06	1741.17	9.21	28.65	1.53									
					1947.755	4.34E-06	1741.09	9.22	28.5	1.53									
					1947.737	4.21E-06	1741	9.29	27.73	1.53									
					1947.719	4.26E-06	1740.92	9.35	27.01	1.53									
					1947.7	4.38E-06	1740.84	9.39	26.51	1.53									
					1947.682	4.26E-06	1740.75	9.45	25.69	1.53									
					1947.664	4.5E-06	1740.67	9.43	26.04	1.53									
					1947.646	4.54E-06	1740.59	9.36	26.79	1.53									
					1947.628	4.6E-06	1740.5	9.33	27.21	1.53									
					1947.61	4.52E-06	1740.42	9.28	27.75	1.54									
					1947.591	4.57E-06	1740.34	9.25	28.11	1.54									
					1947.573	4.55E-06	1740.25	9.23	28.37	1.54									
					1947.555	4.55E-06	1740.17	9.17	29.13	1.55									
					1947.535	4.59E-06	1740.09	9.29	27.67	1.55									
					1947.515	4.49E-06	1740	9.35	27	1.55									
					1947.495	4.84E-06	1739.92	9.43	26.02	1.56									
					1947.475	4.57E-06	1739.84	9.45	25.76	1.56									
					1947.455	5.21E-06	1739.75	9.43	25.98	1.56									
					1947.435	5.32E-06	1739.67	9.41	26.21	1.57									
					1947.415	5.84E-06	1739.59	9.37	26.7	1.57									
					1947.395	5.94E-06	1739.5	9.31	27.42	1.58									
					1947.375	5.92E-06	1739.42	9.28	27.81	1.58									
					1947.355	7.36E-06	1739.34	9.24	28.32	1.59									
					1947.335	6.34E-06	1739.25	9.22	28.56	1.59									
					1947.315	6.58E-06	1739.17	9.18	29.01	1.6									
					1947.295	6.62E-06	1739.09	9.24	28.23	1.6									
					1947.275	6.94E-06	1739	9.24	28.28	1.61									
					1947.255	7.19E-06	1738.92	9.33	27.19	1.61									
					1947.235	7.43E-06	1738.84	9.39	26.4	1.61									
					1947.215	6.06E-06	1738.75	9.39	26.46	1.62									
					1947.195	5.05E-06	1738.67	9.42	26.1	1.62									
					1947.175	4.99E-06	1738.59	9.42	26.1	1.62									
					1947.155	5.23E-06	1738.5	9.33	27.14	1.62									
					1947.135	4.49E-06	1738.42	9.24	28.28	1.63									
					1947.115	4.07E-06	1738.34	9.22	28.51	1.63									
					1947.095	4.02E-06	1738.25	9.19	28.88	1.63									

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003		Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1947.075	3.81E-06	1738.17	9.18	29.01	1.63									
					1947.055	4.07E-06	1738.09	9.24	28.23	1.63									
					1947.035	3.75E-06	1738	9.26	28.07	1.63									
					1947.015	3.98E-06	1737.92	9.28	27.8	1.63									
					1946.995	3.8E-06	1737.84	9.31	27.46	1.62									
					1946.975	4.03E-06	1737.75	9.33	27.19	1.62									
					1946.955	3.87E-06	1737.67	9.33	27.18	1.62									
					1946.935	3.93E-06	1737.59	9.33	27.18	1.61									
					1946.915	3.99E-06	1737.5	9.34	27.02	1.61									
					1946.895	0.000004	1737.42	9.32	27.27	1.6									
					1946.875	3.87E-06	1737.34	9.29	27.68	1.6									
					1946.855	4.06E-06	1737.25	9.23	28.44	1.59									
					1946.835	4.14E-06	1737.17	9.19	28.89	1.58									
					1946.815	4.12E-06	1737.09	9.3	27.59	1.58									
					1946.795	3.97E-06	1737	9.23	28.35	1.57									
					1946.775	3.96E-06	1736.92	9.22	28.59	1.56									
					1946.755	3.83E-06	1736.84	9.34	27.1	1.55									
					1946.735	4.08E-06	1736.75	9.4	26.35	1.54									
					1946.715	4.34E-06	1736.67	9.43	26.04	1.54									
					1946.695	4.67E-06	1736.59	9.44	25.9	1.53									
					1946.675	4.75E-06	1736.5	9.41	26.23	1.52									
					1946.655	4.78E-06	1736.42	9.32	27.28	1.51									
					1946.635	4.5E-06	1736.34	9.28	27.84	1.5									
					1946.615	4.91E-06	1736.25	9.27	27.92	1.49									
					1946.595	5.39E-06	1736.17	9.26	28.04	1.48									
					1946.575	6.28E-06	1736.09	9.29	27.7	1.47									
					1946.555	6.58E-06	1736	9.34	27.12	1.46									
					1946.539	6.37E-06	1735.92	9.37	26.7	1.45									
					1946.524	6.63E-06	1735.84	9.39	26.51	1.44									
					1946.508	6.24E-06	1735.75	9.4	26.4	1.44									
					1946.493	6.29E-06	1735.67	9.4	26.34	1.43									
					1946.477	6.54E-06	1735.59	9.38	26.57	1.42									
					1946.462	6.56E-06	1735.5	9.32	27.27	1.41									
					1946.446	6.57E-06	1735.42	9.26	28.04	1.4									
					1946.431	6.49E-06	1735.34	9.25	28.11	1.39									
					1946.415	6.44E-06	1735.25	9.22	28.55	1.38									
					1946.4	6.6E-06	1735.17	9.2	28.77	1.37									
					1946.384	6.13E-06	1735.09	9.26	28.09	1.36									
					1946.369	6.13E-06	1735	9.27	27.91	1.35									
					1946.353	6.01E-06	1734.92	9.27	27.95	1.34									
					1946.338	6.3E-06	1734.84	9.3	27.5	1.34									
					1946.322	6.36E-06	1734.75	9.35	26.92	1.33									
					1946.307	6.27E-06	1734.67	9.42	26.15	1.32									
					1946.291	6.65E-06	1734.59	9.46	25.56	1.31									
					1946.276	7.57E-06	1734.5	9.39	26.42	1.3									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1946.26	6.9E-06	1734.42	9.38	26.62	1.29									
					1946.245	6.43E-06	1734.34	9.36	26.83	1.29									
					1946.229	7.24E-06	1734.25	9.31	27.39	1.28									
					1946.214	7.37E-06	1734.17	9.27	27.92	1.27									
					1946.198	1.03E-05	1734.09	9.28	27.81	1.27									
					1946.183	9.24E-06	1734	9.36	26.87	1.26									
					1946.167	8.3E-06	1733.92	9.37	26.7	1.25									
					1946.152	9.72E-06	1733.84	9.42	26.14	1.25									
					1946.136	8.79E-06	1733.75	9.47	25.51	1.25									
					1946.121	8.88E-06	1733.67	9.46	25.61	1.24									
					1946.105	8.31E-06	1733.59	9.4	26.29	1.24									
					1946.09	7.53E-06	1733.5	9.47	25.52	1.24									
					1946.074	6.33E-06	1733.42	9.38	26.58	1.24									
					1946.059	7.51E-06	1733.34	9.29	27.71	1.23									
					1946.043	7.95E-06	1733.25	9.25	28.15	1.23									
					1946.028	7.22E-06	1733.17	9.23	28.41	1.23									
					1946.012	7.01E-06	1733.09	9.27	27.94	1.23									
					1945.996	5.87E-06	1733	9.27	27.88	1.23									
					1945.981	4.73E-06	1732.92	9.33	27.24	1.23									
					1945.965	4.34E-06	1732.84	9.4	26.3	1.23									
					1945.95	5.33E-06	1732.75	9.43	26.01	1.22									
					1945.934	4.8E-06	1732.67	9.44	25.84	1.22									
					1945.919	4.18E-06	1732.59	9.37	26.68	1.22									
					1945.903	4.34E-06	1732.5	9.28	27.76	1.22									
					1945.888	4.21E-06	1732.42	9.23	28.39	1.22									
					1945.872	3.96E-06	1732.34	9.25	28.17	1.21									
					1945.857	3.84E-06	1732.25	9.23	28.37	1.21									
					1945.841	3.89E-06	1732.17	9.21	28.65	1.21									
					1945.826	3.88E-06	1732.09	9.27	27.97	1.2									
					1945.81	4.3E-06	1732	9.35	26.99	1.2									
					1945.795	4.5E-06	1731.92	9.37	26.7	1.2									
					1945.779	3.98E-06	1731.84	9.36	26.82	1.19									
					1945.764	4.1E-06	1731.75	9.34	27.06	1.19									
					1945.748	3.98E-06	1731.67	9.45	25.73	1.18									
					1945.733	4.12E-06	1731.59	9.39	26.52	1.18									
					1945.717	4.11E-06	1731.5	9.35	26.93	1.17									
					1945.702	4.03E-06	1731.42	9.3	27.56	1.17									
					1945.686	3.94E-06	1731.34	9.28	27.78	1.16									
					1945.671	3.93E-06	1731.25	9.26	28.03	1.15									
					1945.655	3.71E-06	1731.17	9.24	28.28	1.15									
					1945.64	4.03E-06	1731.09	9.33	27.15	1.14									
					1945.624	4.02E-06	1731	9.42	26.15	1.14									
					1945.609	4.37E-06	1730.92	9.46	25.58	1.13									
					1945.593	4.56E-06	1730.84	9.44	25.85	1.13									
					1945.578	4.87E-06	1730.75	9.43	25.99	1.12									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1945.562	5.34E-06	1730.67	9.41	26.28	1.11									
					1945.547	5.16E-06	1730.59	9.37	26.73	1.11									
					1945.531	4.27E-06	1730.5	9.32	27.35	1.1									
					1945.516	5.14E-06	1730.42	9.29	27.73	1.1									
					1945.5	4.62E-06	1730.34	9.28	27.8	1.09									
					1945.479	4.45E-06	1730.25	9.29	27.7	1.09									
					1945.458	7.23E-06	1730.17	9.29	27.68	1.08									
					1945.437	6.49E-06	1730.09	9.3	27.58	1.08									
					1945.416	7.03E-06	1730	9.37	26.74	1.07									
					1945.395	5.55E-06	1729.92	9.42	26.16	1.07									
					1945.374	5.83E-06	1729.84	9.44	25.89	1.07									
					1945.353	4.52E-06	1729.75	9.46	25.65	1.06									
					1945.332	4.15E-06	1729.67	9.49	25.25	1.06									
					1945.311	4.04E-06	1729.59	9.42	26.16	1.05									
					1945.29	3.98E-06	1729.5	9.37	26.66	1.05									
					1945.269	3.96E-06	1729.42	9.34	27.13	1.05									
					1945.248	4.03E-06	1729.34	9.3	27.6	1.05									
					1945.227	4.37E-06	1729.25	9.27	27.98	1.04									
					1945.206	4.36E-06	1729.17	9.24	28.28	1.04									
					1945.185	5.17E-06	1729.09	9.26	28.03	1.04									
					1945.164	6.19E-06	1729	9.29	27.64	1.04									
					1945.143	5.99E-06	1728.92	9.34	27.04	1.03									
					1945.122	5.47E-06	1728.84	9.41	26.18	1.03									
					1945.101	5.96E-06	1728.75	9.44	25.87	1.03									
					1945.08	4.67E-06	1728.67	9.47	25.49	1.03									
					1945.059	4.38E-06	1728.59	9.46	25.62	1.02									
					1945.038	4.17E-06	1728.5	9.43	26.02	1.02									
					1945.017	4.37E-06	1728.42	9.36	26.83	1.02									
					1944.996	4.34E-06	1728.34	9.33	27.17	1.02									
					1944.975	3.9E-06	1728.25	9.3	27.6	1.02									
					1944.954	3.92E-06	1728.17	9.25	28.16	1.01									
					1944.933	3.7E-06	1728.09	9.26	28.02	1.01									
					1944.912	3.78E-06	1728	9.31	27.39	1.01									
					1944.891	3.56E-06	1727.92	9.36	26.89	1.01									
					1944.87	3.63E-06	1727.84	9.37	26.74	1									
					1944.849	3.55E-06	1727.75	9.38	26.64	1									
					1944.828	3.89E-06	1727.67	9.43	25.98	1									
					1944.807	3.71E-06	1727.59	9.44	25.81	1									
					1944.786	3.8E-06	1727.5	9.41	26.26	0.99									
					1944.765	3.71E-06	1727.42	9.33	27.16	0.99									
					1944.744	3.71E-06	1727.34	9.29	27.63	0.99									
					1944.723	4.06E-06	1727.25	9.28	27.78	0.99									
					1944.702	4.1E-06	1727.17	9.27	27.92	0.98									
					1944.681	4.12E-06	1727.09	9.29	27.66	0.98									
					1944.66	0.000004	1727	9.33	27.14	0.98									

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1944.639	4.17E-06	1726.92	9.39	26.46	0.97									
					1944.618	4.21E-06	1726.84	9.45	25.77	0.97									
					1944.597	4.19E-06	1726.75	9.42	26.13	0.96									
					1944.576	4.2E-06	1726.67	9.38	26.59	0.96									
					1944.555	4.2E-06													
					1944.533	4.4E-06													
					1944.51	4.75E-06													
					1944.488	5.22E-06													
					1944.466	5.28E-06													
					1944.443	5.18E-06													
					1944.421	5.74E-06													
					1944.399	5.03E-06													
					1944.376	5.41E-06													
					1944.354	5.62E-06													
					1944.332	5.85E-06													
					1944.309	5.82E-06													
					1944.287	6.39E-06													
					1944.265	6.33E-06													
					1944.242	5.96E-06													
					1944.22	6.13E-06													
					1944.198	4.89E-06													
					1944.175	4.22E-06													
					1944.153	4.09E-06													
					1944.131	4.17E-06													
					1944.108	4.09E-06													
					1944.086	3.93E-06													
					1944.064	3.95E-06													
					1944.041	3.76E-06													
					1944.019	3.69E-06													
					1943.997	3.85E-06													
					1943.974	3.87E-06													
					1943.952	3.82E-06													
					1943.93	3.7E-06													
					1943.907	3.69E-06													
					1943.885	3.73E-06													
					1943.863	3.89E-06													
					1943.84	3.85E-06													
					1943.818	3.75E-06													
					1943.796	3.73E-06													
					1943.773	3.91E-06													
					1943.751	4.13E-06													
					1943.729	4.27E-06													
					1943.706	4.22E-06													
					1943.684	4.05E-06													
					1943.662	4.06E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1943.639	3.88E-06													
					1943.617	3.98E-06													
					1943.595	4.35E-06													
					1943.572	4.34E-06													
					1943.55	4.38E-06													
					1943.522	4.2E-06													
					1943.494	4.15E-06													
					1943.467	4.07E-06													
					1943.439	4.3E-06													
					1943.411	4.27E-06													
					1943.383	4.41E-06													
					1943.356	4.38E-06													
					1943.328	4.81E-06													
					1943.3	5.27E-06													
					1943.272	5.13E-06													
					1943.244	4.76E-06													
					1943.217	4.64E-06													
					1943.189	4.49E-06													
					1943.161	4.34E-06													
					1943.133	4.4E-06													
					1943.106	4.21E-06													
					1943.078	4.12E-06													
					1943.05	3.98E-06													
					1943.022	4.03E-06													
					1942.994	0.000004													
					1942.967	3.94E-06													
					1942.939	3.93E-06													
					1942.911	3.98E-06													
					1942.883	3.87E-06													
					1942.856	4.07E-06													
					1942.828	3.71E-06													
					1942.8	3.83E-06													
					1942.772	3.82E-06													
					1942.744	3.96E-06													
					1942.717	4.06E-06													
					1942.689	3.98E-06													
					1942.661	3.98E-06													
					1942.633	0.000004													
					1942.606	3.82E-06													
					1942.578	3.89E-06													
					1942.55	4.16E-06													
					1942.538	3.96E-06													
					1942.526	4.11E-06													
					1942.515	4.1E-06													
					1942.503	4.15E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1942.491	4.54E-06													
					1942.479	4.2E-06													
					1942.468	4.22E-06													
					1942.456	4.22E-06													
					1942.444	4.21E-06													
					1942.432	4.13E-06													
					1942.421	4.5E-06													
					1942.409	4.25E-06													
					1942.397	4.16E-06													
					1942.385	4.06E-06													
					1942.374	4.41E-06													
					1942.362	4.45E-06													
					1942.35	4.46E-06													
					1942.338	4.28E-06													
					1942.326	4.15E-06													
					1942.315	4.08E-06													
					1942.303	3.55E-06													
					1942.291	3.03E-06													
					1942.279	3.23E-06													
					1942.268	3.01E-06													
					1942.256	2.95E-06													
					1942.244	3.06E-06													
					1942.232	3.3E-06													
					1942.221	3.38E-06													
					1942.209	4.01E-06													
					1942.197	3.91E-06													
					1942.185	3.73E-06													
					1942.174	3.71E-06													
					1942.162	3.81E-06													
					1942.15	3.94E-06													
					1942.138	3.83E-06													
					1942.126	3.8E-06													
					1942.115	3.94E-06													
					1942.103	3.71E-06													
					1942.091	3.83E-06													
					1942.079	3.85E-06													
					1942.068	3.85E-06													
					1942.056	3.69E-06													
					1942.044	3.81E-06													
					1942.032	3.94E-06													
					1942.021	4.04E-06													
					1942.009	4.08E-06													
					1941.997	4.11E-06													
					1941.985	3.91E-06													
					1941.974	4.06E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1941.962	3.96E-06													
					1941.95	3.85E-06													
					1941.938	3.83E-06													
					1941.926	4.05E-06													
					1941.915	4.02E-06													
					1941.903	3.93E-06													
					1941.891	3.93E-06													
					1941.879	0.000004													
					1941.868	4.01E-06													
					1941.856	4.11E-06													
					1941.844	0.000004													
					1941.832	3.88E-06													
					1941.821	3.98E-06													
					1941.809	3.98E-06													
					1941.797	3.86E-06													
					1941.785	3.87E-06													
					1941.774	3.82E-06													
					1941.762	3.76E-06													
					1941.75	3.96E-06													
					1941.738	3.93E-06													
					1941.726	3.97E-06													
					1941.715	3.91E-06													
					1941.703	3.9E-06													
					1941.691	3.88E-06													
					1941.679	3.78E-06													
					1941.668	4.11E-06													
					1941.656	4.06E-06													
					1941.644	4.03E-06													
					1941.632	4.12E-06													
					1941.621	3.77E-06													
					1941.609	4.03E-06													
					1941.597	4.06E-06													
					1941.585	4.19E-06													
					1941.574	4.28E-06													
					1941.562	4.22E-06													
					1941.55	4.4E-06													
					1941.53	4.53E-06													
					1941.509	4.4E-06													
					1941.489	4.45E-06													
					1941.468	4.47E-06													
					1941.448	4.57E-06													
					1941.428	4.55E-06													
					1941.407	4.57E-06													
					1941.387	4.49E-06													
					1941.366	4.51E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1941.346	4.39E-06													
					1941.326	4.51E-06													
					1941.305	4.48E-06													
					1941.285	4.54E-06													
					1941.264	4.66E-06													
					1941.244	5.32E-06													
					1941.223	5.41E-06													
					1941.203	5.12E-06													
					1941.183	4.98E-06													
					1941.162	5.3E-06													
					1941.142	5.28E-06													
					1941.121	5.1E-06													
					1941.101	5.11E-06													
					1941.081	4.99E-06													
					1941.06	5.19E-06													
					1941.04	4.99E-06													
					1941.019	4.63E-06													
					1940.999	4.66E-06													
					1940.979	4.58E-06													
					1940.958	4.4E-06													
					1940.938	4.28E-06													
					1940.917	4.15E-06													
					1940.897	3.94E-06													
					1940.877	0.000004													
					1940.856	3.92E-06													
					1940.836	3.82E-06													
					1940.815	3.99E-06													
					1940.795	4.61E-06													
					1940.774	4.88E-06													
					1940.754	4.86E-06													
					1940.734	4.8E-06													
					1940.713	4.89E-06													
					1940.693	5.01E-06													
					1940.672	4.8E-06													
					1940.652	5.02E-06													
					1940.632	4.62E-06													
					1940.611	5.17E-06													
					1940.591	5.36E-06													
					1940.57	5.21E-06													
					1940.55	5.41E-06													
					1940.532	6.57E-06													
					1940.514	6.48E-06													
					1940.496	6.13E-06													
					1940.479	7.57E-06													
					1940.461	6.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1940.443	7.92E-06													
					1940.425	9.4E-06													
					1940.407	9.32E-06													
					1940.389	8.17E-06													
					1940.371	8.36E-06													
					1940.354	7.15E-06													
					1940.336	6.37E-06													
					1940.318	5.96E-06													
					1940.3	4.4E-06													
					1940.282	3.72E-06													
					1940.264	3.59E-06													
					1940.246	3.48E-06													
					1940.229	3.59E-06													
					1940.211	3.45E-06													
					1940.193	3.81E-06													
					1940.175	3.57E-06													
					1940.157	3.58E-06													
					1940.139	3.49E-06													
					1940.121	3.57E-06													
					1940.104	3.82E-06													
					1940.086	3.77E-06													
					1940.068	3.81E-06													
					1940.05	3.85E-06													
					1940.032	3.84E-06													
					1940.014	3.92E-06													
					1939.996	4.01E-06													
					1939.979	3.91E-06													
					1939.961	4.01E-06													
					1939.943	4.06E-06													
					1939.925	4.02E-06													
					1939.907	4.07E-06													
					1939.889	3.97E-06													
					1939.871	4.4E-06													
					1939.854	4.28E-06													
					1939.836	4.35E-06													
					1939.818	4.33E-06													
					1939.8	4.26E-06													
					1939.782	4.28E-06													
					1939.764	4.3E-06													
					1939.746	4.12E-06													
					1939.729	4.11E-06													
					1939.711	4.09E-06													
					1939.693	4.1E-06													
					1939.675	3.97E-06													
					1939.657	0.000004													

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1939.639	0.000004													
					1939.621	3.76E-06													
					1939.604	3.88E-06													
					1939.586	3.99E-06													
					1939.568	4.05E-06													
					1939.55	4.06E-06													
					1939.522	4.02E-06													
					1939.494	4.02E-06													
					1939.467	3.89E-06													
					1939.439	3.97E-06													
					1939.411	3.98E-06													
					1939.383	3.86E-06													
					1939.356	3.82E-06													
					1939.328	3.81E-06													
					1939.3	3.93E-06													
					1939.272	3.9E-06													
					1939.244	3.8E-06													
					1939.217	3.95E-06													
					1939.189	0.000004													
					1939.161	3.86E-06													
					1939.133	4.2E-06													
					1939.106	0.000004													
					1939.078	3.92E-06													
					1939.05	4.03E-06													
					1939.022	3.91E-06													
					1938.994	4.09E-06													
					1938.967	4.07E-06													
					1938.939	3.93E-06													
					1938.911	3.92E-06													
					1938.883	3.91E-06													
					1938.856	3.96E-06													
					1938.828	3.96E-06													
					1938.8	4.12E-06													
					1938.772	4.07E-06													
					1938.744	4.18E-06													
					1938.717	0.000004													
					1938.689	4.3E-06													
					1938.661	4.29E-06													
					1938.633	4.34E-06													
					1938.606	4.17E-06													
					1938.578	4.17E-06													
					1938.55	4.27E-06													
					1938.519	4.35E-06													
					1938.488	4.45E-06													
					1938.456	4.76E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1938.425	4.84E-06													
					1938.394	4.96E-06													
					1938.363	4.91E-06													
					1938.331	4.97E-06													
					1938.3	4.97E-06													
					1938.269	4.85E-06													
					1938.238	4.68E-06													
					1938.206	4.49E-06													
					1938.175	4.48E-06													
					1938.144	4.44E-06													
					1938.113	4.39E-06													
					1938.081	4.25E-06													
					1938.05	4.02E-06													
					1938.019	3.98E-06													
					1937.988	3.66E-06													
					1937.956	3.99E-06													
					1937.925	4.09E-06													
					1937.894	4.1E-06													
					1937.863	3.92E-06													
					1937.831	3.79E-06													
					1937.8	3.86E-06													
					1937.769	3.88E-06													
					1937.738	0.000004													
					1937.706	3.99E-06													
					1937.675	3.96E-06													
					1937.644	4.13E-06													
					1937.613	4.13E-06													
					1937.581	4.27E-06													
					1937.55	4.13E-06													
					1937.53	4.06E-06													
					1937.51	3.99E-06													
					1937.49	4.08E-06													
					1937.47	3.79E-06													
					1937.45	3.81E-06													
					1937.43	3.81E-06													
					1937.41	5.04E-06													
					1937.39	5.35E-06													
					1937.37	5.23E-06													
					1937.35	5.04E-06													
					1937.33	4.83E-06													
					1937.31	4.75E-06													
					1937.29	4.51E-06													
					1937.27	4.3E-06													
					1937.25	4.06E-06													
					1937.23	4.1E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1937.21	3.96E-06													
					1937.19	4.13E-06													
					1937.17	4.36E-06													
					1937.15	4.43E-06													
					1937.13	4.08E-06													
					1937.11	3.98E-06													
					1937.09	3.94E-06													
					1937.07	3.88E-06													
					1937.05	4.05E-06													
					1937.03	3.86E-06													
					1937.01	3.81E-06													
					1936.99	3.84E-06													
					1936.97	3.81E-06													
					1936.95	3.83E-06													
					1936.93	3.73E-06													
					1936.91	4.03E-06													
					1936.89	3.68E-06													
					1936.87	3.48E-06													
					1936.85	3.6E-06													
					1936.83	3.62E-06													
					1936.81	3.84E-06													
					1936.79	3.99E-06													
					1936.77	4.09E-06													
					1936.75	4.4E-06													
					1936.73	4.17E-06													
					1936.71	4.12E-06													
					1936.69	4.09E-06													
					1936.67	4.03E-06													
					1936.65	4.09E-06													
					1936.63	3.93E-06													
					1936.61	4.12E-06													
					1936.59	4.1E-06													
					1936.57	4.03E-06													
					1936.55	4.12E-06													
					1936.528	0.000004													
					1936.506	3.96E-06													
					1936.483	4.19E-06													
					1936.461	4.16E-06													
					1936.439	3.99E-06													
					1936.417	4.23E-06													
					1936.394	4.3E-06													
					1936.372	4.62E-06													
					1936.35	6.73E-06													
					1936.328	9.34E-06													
					1936.306	9.68E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1936.283	7.3E-06													
					1936.261	5.62E-06													
					1936.239	5.02E-06													
					1936.217	4.33E-06													
					1936.194	3.85E-06													
					1936.172	3.64E-06													
					1936.15	3.61E-06													
					1936.128	3.53E-06													
					1936.106	3.52E-06													
					1936.083	3.49E-06													
					1936.061	3.51E-06													
					1936.039	3.51E-06													
					1936.017	3.54E-06													
					1935.994	3.65E-06													
					1935.972	3.73E-06													
					1935.95	3.84E-06													
					1935.928	3.88E-06													
					1935.906	3.73E-06													
					1935.883	3.8E-06													
					1935.861	3.62E-06													
					1935.839	3.8E-06													
					1935.817	3.75E-06													
					1935.794	3.63E-06													
					1935.772	3.64E-06													
					1935.75	3.56E-06													
					1935.728	3.69E-06													
					1935.706	3.91E-06													
					1935.683	3.98E-06													
					1935.661	4.18E-06													
					1935.639	4.24E-06													
					1935.617	4.39E-06													
					1935.594	4.15E-06													
					1935.572	4.02E-06													
					1935.55	4.22E-06													
					1935.527	4.19E-06													
					1935.505	4.33E-06													
					1935.482	4.4E-06													
					1935.459	4.3E-06													
					1935.436	4.25E-06													
					1935.414	4.31E-06													
					1935.391	4.17E-06													
					1935.368	3.87E-06													
					1935.345	3.74E-06													
					1935.323	3.75E-06													
					1935.3	3.59E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1935.277	3.46E-06													
					1935.255	3.49E-06													
					1935.232	3.39E-06													
					1935.209	3.44E-06													
					1935.186	3.62E-06													
					1935.164	3.92E-06													
					1935.141	3.83E-06													
					1935.118	3.77E-06													
					1935.095	4.04E-06													
					1935.073	3.69E-06													
					1935.05	3.85E-06													
					1935.027	3.84E-06													
					1935.005	3.92E-06													
					1934.982	4.05E-06													
					1934.959	3.9E-06													
					1934.936	3.93E-06													
					1934.914	3.7E-06													
					1934.891	3.71E-06													
					1934.868	3.78E-06													
					1934.845	3.65E-06													
					1934.823	3.76E-06													
					1934.8	3.77E-06													
					1934.777	3.67E-06													
					1934.755	3.75E-06													
					1934.732	3.88E-06													
					1934.709	3.75E-06													
					1934.686	3.89E-06													
					1934.664	3.88E-06													
					1934.641	3.95E-06													
					1934.618	4.08E-06													
					1934.595	4.09E-06													
					1934.573	4.21E-06													
					1934.55	4.32E-06													
					1934.53	3.87E-06													
					1934.51	4.09E-06													
					1934.49	4.16E-06													
					1934.47	4.05E-06													
					1934.45	4.11E-06													
					1934.43	4.06E-06													
					1934.41	4.03E-06													
					1934.39	4.05E-06													
					1934.37	4.17E-06													
					1934.35	4.19E-06													
					1934.33	4.51E-06													
					1934.31	4.47E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1934.29	4.69E-06													
					1934.27	4.57E-06													
					1934.25	5.21E-06													
					1934.23	6.14E-06													
					1934.21	5.95E-06													
					1934.19	5.32E-06													
					1934.17	6.43E-06													
					1934.15	6.33E-06													
					1934.13	6.01E-06													
					1934.11	5.63E-06													
					1934.09	5.12E-06													
					1934.07	4.5E-06													
					1934.05	4.73E-06													
					1934.03	4.34E-06													
					1934.01	4.32E-06													
					1933.99	4.34E-06													
					1933.97	4.5E-06													
					1933.95	3.88E-06													
					1933.93	3.94E-06													
					1933.91	3.81E-06													
					1933.89	3.77E-06													
					1933.87	3.76E-06													
					1933.85	3.92E-06													
					1933.83	4.1E-06													
					1933.81	3.83E-06													
					1933.79	3.82E-06													
					1933.77	3.98E-06													
					1933.75	3.86E-06													
					1933.73	3.89E-06													
					1933.71	3.79E-06													
					1933.69	4.04E-06													
					1933.67	3.93E-06													
					1933.65	4.17E-06													
					1933.63	4.18E-06													
					1933.61	4.27E-06													
					1933.59	4.23E-06													
					1933.57	4.22E-06													
					1933.55	4.35E-06													
					1933.527	4.59E-06													
					1933.505	4.44E-06													
					1933.482	4.58E-06													
					1933.459	4.7E-06													
					1933.436	4.47E-06													
					1933.414	4.75E-06													
					1933.391	4.55E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1933.368	4.87E-06													
					1933.345	4.71E-06													
					1933.323	4.86E-06													
					1933.3	5.08E-06													
					1933.277	5.39E-06													
					1933.255	5.18E-06													
					1933.232	5.46E-06													
					1933.209	5.53E-06													
					1933.186	6.22E-06													
					1933.164	6.45E-06													
					1933.141	6.29E-06													
					1933.118	5.06E-06													
					1933.095	5.05E-06													
					1933.073	5.41E-06													
					1933.05	4.82E-06													
					1933.027	5.13E-06													
					1933.005	4.42E-06													
					1932.982	3.63E-06													
					1932.959	3.66E-06													
					1932.936	3.77E-06													
					1932.914	3.78E-06													
					1932.891	3.82E-06													
					1932.868	3.92E-06													
					1932.845	4.15E-06													
					1932.823	4.24E-06													
					1932.8	4.14E-06													
					1932.777	4.09E-06													
					1932.755	4.06E-06													
					1932.732	4.07E-06													
					1932.709	4.1E-06													
					1932.686	4.16E-06													
					1932.664	4.05E-06													
					1932.641	4.09E-06													
					1932.618	3.87E-06													
					1932.595	3.63E-06													
					1932.573	3.64E-06													
					1932.55	4.03E-06													
					1932.536	3.97E-06													
					1932.521	3.87E-06													
					1932.507	3.86E-06													
					1932.492	3.91E-06													
					1932.478	4.09E-06													
					1932.463	4.1E-06													
					1932.449	4.32E-06													
					1932.434	4.89E-06													

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1932.42	4.11E-06													
					1932.405	3.92E-06													
					1932.391	3.9E-06													
					1932.376	4.11E-06													
					1932.362	4.14E-06													
					1932.347	4.12E-06													
					1932.333	4.25E-06													
					1932.318	4.52E-06													
					1932.304	4.52E-06													
					1932.289	4.39E-06													
					1932.275	4.45E-06													
					1932.26	4.42E-06													
					1932.246	4.39E-06													
					1932.231	4.51E-06													
					1932.217	4.42E-06													
					1932.202	4.32E-06													
					1932.188	4.25E-06													
					1932.173	4.48E-06													
					1932.159	4.52E-06													
					1932.144	4.55E-06													
					1932.13	4.44E-06													
					1932.115	4.67E-06													
					1932.101	5.27E-06													
					1932.086	6.01E-06													
					1932.072	5.51E-06													
					1932.057	5.73E-06													
					1932.043	5.38E-06													
					1932.028	4.86E-06													
					1932.014	4.37E-06													
					1931.999	4.32E-06													
					1931.985	4.49E-06													
					1931.97	4.21E-06													
					1931.956	4.18E-06													
					1931.941	4.18E-06													
					1931.927	3.99E-06													
					1931.912	3.96E-06													
					1931.898	3.91E-06													
					1931.883	4.06E-06													
					1931.869	3.98E-06													
					1931.854	4.03E-06													
					1931.84	4.24E-06													
					1931.825	4.06E-06													
					1931.811	4.04E-06													
					1931.796	4.03E-06													
					1931.782	4.04E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1931.767	3.87E-06													
					1931.753	0.000004													
					1931.738	3.87E-06													
					1931.724	3.97E-06													
					1931.709	3.92E-06													
					1931.695	4.05E-06													
					1931.68	4.07E-06													
					1931.666	3.93E-06													
					1931.651	3.91E-06													
					1931.637	4.02E-06													
					1931.622	4.04E-06													
					1931.608	4.19E-06													
					1931.593	4.26E-06													
					1931.579	4.2E-06													
					1931.564	4.02E-06													
					1931.55	4.02E-06													
					1931.536	4.09E-06													
					1931.521	4.04E-06													
					1931.507	0.000004													
					1931.493	4.03E-06													
					1931.479	3.93E-06													
					1931.464	3.98E-06													
					1931.45	4.03E-06													
					1931.436	4.09E-06													
					1931.421	4.15E-06													
					1931.407	4.12E-06													
					1931.393	4.13E-06													
					1931.379	3.91E-06													
					1931.364	4.04E-06													
					1931.35	4.06E-06													
					1931.336	4.12E-06													
					1931.321	4.18E-06													
					1931.307	4.02E-06													
					1931.293	4.05E-06													
					1931.279	3.93E-06													
					1931.264	3.92E-06													
					1931.25	3.89E-06													
					1931.236	3.92E-06													
					1931.221	3.91E-06													
					1931.207	3.91E-06													
					1931.193	3.72E-06													
					1931.179	3.8E-06													
					1931.164	3.55E-06													
					1931.15	3.44E-06													
					1931.136	3.44E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1931.121	3.31E-06													
					1931.107	3.59E-06													
					1931.093	3.68E-06													
					1931.079	3.64E-06													
					1931.064	3.66E-06													
					1931.05	3.36E-06													
					1931.036	3.59E-06													
					1931.021	3.55E-06													
					1931.007	3.66E-06													
					1930.993	3.62E-06													
					1930.979	3.53E-06													
					1930.964	3.62E-06													
					1930.95	4.14E-06													
					1930.936	4.01E-06													
					1930.921	0.000004													
					1930.907	4.03E-06													
					1930.893	4.05E-06													
					1930.879	3.97E-06													
					1930.864	4.23E-06													
					1930.85	4.03E-06													
					1930.836	3.96E-06													
					1930.821	4.05E-06													
					1930.807	0.000004													
					1930.793	4.17E-06													
					1930.779	4.28E-06													
					1930.764	4.15E-06													
					1930.75	4.15E-06													
					1930.736	4.09E-06													
					1930.721	4.27E-06													
					1930.707	4.52E-06													
					1930.693	4.57E-06													
					1930.679	4.94E-06													
					1930.664	5.24E-06													
					1930.65	5.08E-06													
					1930.636	5.19E-06													
					1930.621	5.4E-06													
					1930.607	5.32E-06													
					1930.593	5.2E-06													
					1930.579	4.89E-06													
					1930.564	4.76E-06													
					1930.55	4.96E-06													
					1930.534	4.75E-06													
					1930.519	4.71E-06													
					1930.503	4.52E-06													
					1930.488	4.39E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1930.472	4.41E-06													
					1930.456	4.34E-06													
					1930.441	4.29E-06													
					1930.425	4.54E-06													
					1930.409	4.53E-06													
					1930.394	4.49E-06													
					1930.378	4.4E-06													
					1930.363	4.58E-06													
					1930.347	4.79E-06													
					1930.331	5.04E-06													
					1930.316	4.88E-06													
					1930.3	5.2E-06													
					1930.284	5.11E-06													
					1930.269	5.37E-06													
					1930.253	5.39E-06													
					1930.238	5.15E-06													
					1930.222	5.52E-06													
					1930.206	6.1E-06													
					1930.191	6.58E-06													
					1930.175	5.54E-06													
					1930.159	6.13E-06													
					1930.144	5.86E-06													
					1930.128	5.78E-06													
					1930.113	5.33E-06													
					1930.097	4.93E-06													
					1930.081	4.95E-06													
					1930.066	4.68E-06													
					1930.05	4.63E-06													
					1930.034	4.48E-06													
					1930.019	4.55E-06													
					1930.003	4.39E-06													
					1929.988	4.63E-06													
					1929.972	4.75E-06													
					1929.956	4.53E-06													
					1929.941	4.38E-06													
					1929.925	4.74E-06													
					1929.909	4.57E-06													
					1929.894	4.3E-06													
					1929.878	4.35E-06													
					1929.863	4.36E-06													
					1929.847	4.47E-06													
					1929.831	4.1E-06													
					1929.816	4.13E-06													
					1929.8	4.21E-06													
					1929.784	4.09E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1929.769	4.23E-06													
					1929.753	4.06E-06													
					1929.738	4.29E-06													
					1929.722	4.2E-06													
					1929.706	4.3E-06													
					1929.691	4.33E-06													
					1929.675	4.05E-06													
					1929.659	4.03E-06													
					1929.644	4.18E-06													
					1929.628	4.41E-06													
					1929.613	4.42E-06													
					1929.597	4.48E-06													
					1929.581	5.01E-06													
					1929.566	4.41E-06													
					1929.55	4.73E-06													
					1929.529	4.82E-06													
					1929.508	4.82E-06													
					1929.488	4.79E-06													
					1929.467	4.95E-06													
					1929.446	5.35E-06													
					1929.425	5.48E-06													
					1929.404	5.81E-06													
					1929.383	0.000006													
					1929.363	5.57E-06													
					1929.342	5.84E-06													
					1929.321	5.41E-06													
					1929.3	5.09E-06													
					1929.279	5.21E-06													
					1929.258	5.02E-06													
					1929.238	5.11E-06													
					1929.217	5.24E-06													
					1929.196	5.22E-06													
					1929.175	5.22E-06													
					1929.154	5.32E-06													
					1929.133	5.77E-06													
					1929.113	5.6E-06													
					1929.092	5.19E-06													
					1929.071	5.44E-06													
					1929.05	5.15E-06													
					1929.029	4.97E-06													
					1929.008	4.76E-06													
					1928.988	4.49E-06													
					1928.967	4.48E-06													
					1928.946	4.57E-06													
					1928.925	4.69E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1928.904	4.23E-06													
					1928.883	4.35E-06													
					1928.863	4.3E-06													
					1928.842	4.25E-06													
					1928.821	4.18E-06													
					1928.8	0.000004													
					1928.779	4.08E-06													
					1928.758	4.01E-06													
					1928.738	4.03E-06													
					1928.717	4.17E-06													
					1928.696	4.33E-06													
					1928.675	4.06E-06													
					1928.654	4.53E-06													
					1928.633	4.9E-06													
					1928.613	4.7E-06													
					1928.592	4.96E-06													
					1928.571	5.13E-06													
					1928.55	5.34E-06													
					1928.521	4.85E-06													
					1928.491	4.6E-06													
					1928.462	4.4E-06													
					1928.432	4.57E-06													
					1928.403	4.59E-06													
					1928.374	4.23E-06													
					1928.344	4.4E-06													
					1928.315	4.33E-06													
					1928.285	4.23E-06													
					1928.256	4.51E-06													
					1928.226	5.19E-06													
					1928.197	5.45E-06													
					1928.168	5.54E-06													
					1928.138	5.71E-06													
					1928.109	5.44E-06													
					1928.079	4.48E-06													
					1928.05	4.16E-06													
					1928.021	4.13E-06													
					1927.991	4.06E-06													
					1927.962	4.3E-06													
					1927.932	4.12E-06													
					1927.903	4.28E-06													
					1927.874	4.45E-06													
					1927.844	4.36E-06													
					1927.815	4.39E-06													
					1927.785	4.48E-06													
					1927.756	4.13E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1927.726	4.11E-06													
					1927.697	4.21E-06													
					1927.668	4.13E-06													
					1927.638	4.24E-06													
					1927.609	4.33E-06													
					1927.579	4.24E-06													
					1927.55	4.54E-06													
					1927.525	4.55E-06													
					1927.5	0.000005													
					1927.475	5.66E-06													
					1927.45	5.79E-06													
					1927.425	6.21E-06													
					1927.4	7.35E-06													
					1927.375	8.26E-06													
					1927.35	8.79E-06													
					1927.325	1E-05													
					1927.3	1.08E-05													
					1927.275	1.05E-05													
					1927.25	1.09E-05													
					1927.225	1.19E-05													
					1927.2	1.21E-05													
					1927.175	1.17E-05													
					1927.15	9.98E-06													
					1927.125	8.89E-06													
					1927.1	8.01E-06													
					1927.075	6.96E-06													
					1927.05	5.64E-06													
					1927.025	4.82E-06													
					1927	4.25E-06													
					1926.975	4.11E-06													
					1926.95	3.99E-06													
					1926.925	3.98E-06													
					1926.9	3.89E-06													
					1926.875	4.02E-06													
					1926.85	3.87E-06													
					1926.825	4.02E-06													
					1926.8	4.06E-06													
					1926.775	4.15E-06													
					1926.75	3.99E-06													
					1926.725	4.06E-06													
					1926.7	3.99E-06													
					1926.675	3.94E-06													
					1926.65	4.21E-06													
					1926.625	4.42E-06													
					1926.6	4.15E-06													

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1926.575	4.1E-06													
					1926.55	4.12E-06													
					1926.528	4.54E-06													
					1926.507	4.7E-06													
					1926.485	4.74E-06													
					1926.463	4.49E-06													
					1926.441	4.38E-06													
					1926.42	4.5E-06													
					1926.398	4.86E-06													
					1926.376	4.75E-06													
					1926.354	4.28E-06													
					1926.333	4.08E-06													
					1926.311	3.86E-06													
					1926.289	4.03E-06													
					1926.267	5.41E-06													
					1926.246	5.61E-06													
					1926.224	3.96E-06													
					1926.202	3.82E-06													
					1926.18	3.49E-06													
					1926.159	3.56E-06													
					1926.137	3.74E-06													
					1926.115	3.87E-06													
					1926.093	3.95E-06													
					1926.072	4.18E-06													
					1926.05	4.06E-06													
					1926.028	4.03E-06													
					1926.007	4.09E-06													
					1925.985	3.99E-06													
					1925.963	4.06E-06													
					1925.941	3.88E-06													
					1925.92	4.02E-06													
					1925.898	3.99E-06													
					1925.876	3.96E-06													
					1925.854	4.03E-06													
					1925.833	4.1E-06													
					1925.811	3.96E-06													
					1925.789	3.58E-06													
					1925.767	3.34E-06													
					1925.746	3.46E-06													
					1925.724	3.68E-06													
					1925.702	4.08E-06													
					1925.68	4.2E-06													
					1925.659	4.21E-06													
					1925.637	4.13E-06													
					1925.615	4.13E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1925.593	4.23E-06													
					1925.572	4.43E-06													
					1925.55	4.37E-06													
					1925.532	4.54E-06													
					1925.514	4.52E-06													
					1925.495	4.44E-06													
					1925.477	4.11E-06													
					1925.459	4.21E-06													
					1925.441	4.06E-06													
					1925.423	4.02E-06													
					1925.405	4.25E-06													
					1925.386	4.35E-06													
					1925.368	5.24E-06													
					1925.35	5.11E-06													
					1925.332	5.02E-06													
					1925.314	5.51E-06													
					1925.295	5.58E-06													
					1925.277	7.25E-06													
					1925.259	7.37E-06													
					1925.241	6.86E-06													
					1925.223	7.13E-06													
					1925.205	6.92E-06													
					1925.186	6.09E-06													
					1925.168	5.17E-06													
					1925.15	4.71E-06													
					1925.132	5.3E-06													
					1925.114	4.68E-06													
					1925.095	4.49E-06													
					1925.077	4.42E-06													
					1925.059	4.39E-06													
					1925.041	4.35E-06													
					1925.023	4.31E-06													
					1925.005	4.01E-06													
					1924.986	3.91E-06													
					1924.968	3.81E-06													
					1924.95	3.81E-06													
					1924.932	3.95E-06													
					1924.914	3.69E-06													
					1924.895	3.83E-06													
					1924.877	3.69E-06													
					1924.859	3.97E-06													
					1924.841	3.97E-06													
					1924.823	3.91E-06													
					1924.805	4.16E-06													
					1924.786	4.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1924.768	4.24E-06													
					1924.75	4.09E-06													
					1924.732	4.17E-06													
					1924.714	4.14E-06													
					1924.695	4.31E-06													
					1924.677	4.39E-06													
					1924.659	4.43E-06													
					1924.641	4.41E-06													
					1924.623	4.54E-06													
					1924.605	5.35E-06													
					1924.586	5.64E-06													
					1924.568	5.4E-06													
					1924.55	5.67E-06													
					1924.52	6.1E-06													
					1924.489	6.56E-06													
					1924.459	6.53E-06													
					1924.429	7.18E-06													
					1924.398	6.32E-06													
					1924.368	4.53E-06													
					1924.338	4.29E-06													
					1924.308	4.36E-06													
					1924.277	4.21E-06													
					1924.247	4.2E-06													
					1924.217	3.92E-06													
					1924.186	3.76E-06													
					1924.156	3.65E-06													
					1924.126	3.64E-06													
					1924.095	3.69E-06													
					1924.065	3.84E-06													
					1924.035	3.9E-06													
					1924.005	3.87E-06													
					1923.974	3.86E-06													
					1923.944	3.82E-06													
					1923.914	3.93E-06													
					1923.883	4.02E-06													
					1923.853	4.02E-06													
					1923.823	4.19E-06													
					1923.792	4.09E-06													
					1923.762	3.99E-06													
					1923.732	4.02E-06													
					1923.702	3.74E-06													
					1923.671	3.84E-06													
					1923.641	3.8E-06													
					1923.611	3.96E-06													
					1923.58	4.03E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1923.55	3.93E-06													
					1923.532	3.94E-06													
					1923.514	3.94E-06													
					1923.495	4.08E-06													
					1923.477	4.82E-06													
					1923.459	4.9E-06													
					1923.441	4.26E-06													
					1923.423	0.000004													
					1923.405	0.000004													
					1923.386	3.81E-06													
					1923.368	3.73E-06													
					1923.35	3.68E-06													
					1923.332	3.74E-06													
					1923.314	3.67E-06													
					1923.295	4.01E-06													
					1923.277	4.26E-06													
					1923.259	4.35E-06													
					1923.241	4.1E-06													
					1923.223	4.37E-06													
					1923.205	4.19E-06													
					1923.186	4.19E-06													
					1923.168	4.26E-06													
					1923.15	4.21E-06													
					1923.132	4.05E-06													
					1923.114	4.17E-06													
					1923.095	4.03E-06													
					1923.077	3.87E-06													
					1923.059	3.82E-06													
					1923.041	3.7E-06													
					1923.023	3.77E-06													
					1923.005	3.61E-06													
					1922.986	3.83E-06													
					1922.968	3.74E-06													
					1922.95	3.74E-06													
					1922.932	3.84E-06													
					1922.914	3.93E-06													
					1922.895	3.82E-06													
					1922.877	3.92E-06													
					1922.859	3.86E-06													
					1922.841	3.8E-06													
					1922.823	3.65E-06													
					1922.805	3.5E-06													
					1922.786	3.58E-06													
					1922.768	3.65E-06													
					1922.75	3.81E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1922.732	3.8E-06													
					1922.714	3.84E-06													
					1922.695	3.96E-06													
					1922.677	4.02E-06													
					1922.659	4.12E-06													
					1922.641	4.29E-06													
					1922.623	4.2E-06													
					1922.605	4.22E-06													
					1922.586	4.14E-06													
					1922.568	4.22E-06													
					1922.55	4.24E-06													
					1922.524	4.05E-06													
					1922.499	3.97E-06													
					1922.473	4.02E-06													
					1922.447	4.13E-06													
					1922.422	4.43E-06													
					1922.396	4.69E-06													
					1922.371	5.32E-06													
					1922.345	5.14E-06													
					1922.319	5.52E-06													
					1922.294	5.4E-06													
					1922.268	5.6E-06													
					1922.242	5.65E-06													
					1922.217	5.35E-06													
					1922.191	5.59E-06													
					1922.165	5.17E-06													
					1922.14	4.55E-06													
					1922.114	5.28E-06													
					1922.088	4.21E-06													
					1922.063	3.95E-06													
					1922.037	4.05E-06													
					1922.012	3.98E-06													
					1921.986	4.12E-06													
					1921.96	4.03E-06													
					1921.935	4.02E-06													
					1921.909	3.97E-06													
					1921.883	4.1E-06													
					1921.858	3.94E-06													
					1921.832	3.93E-06													
					1921.806	3.98E-06													
					1921.781	4.14E-06													
					1921.755	3.88E-06													
					1921.729	4.37E-06													
					1921.704	4.09E-06													
					1921.678	4.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1921.653	4.19E-06													
					1921.627	4.06E-06													
					1921.601	4.15E-06													
					1921.576	4.07E-06													
					1921.55	4.21E-06													
					1921.525	4.12E-06													
					1921.5	4.25E-06													
					1921.475	4.86E-06													
					1921.45	4.44E-06													
					1921.425	4.57E-06													
					1921.4	4.56E-06													
					1921.375	4.11E-06													
					1921.35	4.09E-06													
					1921.325	4.1E-06													
					1921.3	4.01E-06													
					1921.275	4.15E-06													
					1921.25	4.35E-06													
					1921.225	4.58E-06													
					1921.2	4.47E-06													
					1921.175	4.33E-06													
					1921.15	4.39E-06													
					1921.125	4.19E-06													
					1921.1	4.16E-06													
					1921.075	4.29E-06													
					1921.05	4.19E-06													
					1921.025	4.08E-06													
					1921	4.26E-06													
					1920.975	4.11E-06													
					1920.95	4.04E-06													
					1920.925	4.01E-06													
					1920.9	4.14E-06													
					1920.875	4.3E-06													
					1920.85	4.47E-06													
					1920.825	4.48E-06													
					1920.8	4.3E-06													
					1920.775	4.44E-06													
					1920.75	4.43E-06													
					1920.725	4.43E-06													
					1920.7	4.61E-06													
					1920.675	4.49E-06													
					1920.65	4.38E-06													
					1920.625	4.36E-06													
					1920.6	4.49E-06													
					1920.575	4.54E-06													
					1920.55	4.37E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1920.521	4.26E-06													
					1920.493	4.22E-06													
					1920.464	4.24E-06													
					1920.436	4.45E-06													
					1920.407	4.62E-06													
					1920.379	5.08E-06													
					1920.35	5.03E-06													
					1920.321	5.12E-06													
					1920.293	5.07E-06													
					1920.264	4.66E-06													
					1920.236	4.2E-06													
					1920.207	4.1E-06													
					1920.179	4.23E-06													
					1920.15	4.11E-06													
					1920.121	4.04E-06													
					1920.093	4.19E-06													
					1920.064	4.01E-06													
					1920.036	4.21E-06													
					1920.007	4.01E-06													
					1919.979	4.24E-06													
					1919.95	4.17E-06													
					1919.921	3.98E-06													
					1919.893	4.02E-06													
					1919.864	3.88E-06													
					1919.836	4.02E-06													
					1919.807	4.01E-06													
					1919.779	4.49E-06													
					1919.75	4.49E-06													
					1919.721	4.57E-06													
					1919.693	4.56E-06													
					1919.664	4.44E-06													
					1919.636	4.32E-06													
					1919.607	4.18E-06													
					1919.579	4.22E-06													
					1919.55	4.27E-06													
					1919.518	75 0.00000427													
					1919.487	5 0.00000435													
					1919.456	25 0.00000438													
					1919.425	4.57E-06													
					1919.393	75 0.00000430													
					1919.362	5 0.00000436													
					1919.331	25 0.00000438													
					1919.3	4.31E-06													
					1919.268	75 0.00000420													
					1919.237	5 0.00000412													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1919.206	25 0.00000400													
					1919.175	3.97E-06													
					1919.143	75 0.00000408													
					1919.112	5 0.00000419													
					1919.081	25 0.00000429													
					1919.05	4.12E-06													
					1919.018	75 0.00000440													
					1918.987	5 0.00000445													
					1918.956	25 0.00000444													
					1918.925	4.51E-06													
					1918.893	75 0.00000444													
					1918.862	5 0.00000436													
					1918.831	25 0.00000442													
					1918.8	4.32E-06													
					1918.768	75 0.00000420													
					1918.737	5 0.00000413													
					1918.706	25 0.00000424													
					1918.675	4.14E-06													
					1918.643	75 0.00000426													
					1918.612	5 0.00000409													
					1918.581	25 0.00000431													
					1918.55	4.42E-06													
					1918.519	7 0.00000446													
					1918.489	39 0.00000477													
					1918.459	09 0.00000518													
					1918.428	79 0.00000523													
					1918.398	48 0.00000506													
					1918.368	18 0.00000509													
					1918.337	88 0.00000521													
					1918.307	58 0.00000512													
					1918.277	27 0.00000533													
					1918.246	97 0.00000498													
					1918.216	67 0.00000541													
					1918.186	36 0.00000565													
					1918.156	06 0.00000575													
					1918.125	76 0.00000662													
					1918.095	45 0.00000772													
					1918.065	15 0.00000821													
					1918.034	85 0.00000756													
					1918.004	55 0.00000606													
					1917.974	24 0.00000501													
					1917.943	94 0.00000449													
					1917.913	64 0.00000443													
					1917.883	33 0.00000436													
					1917.853	03 0.00000462													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1917.822	73 0.00000474													
					1917.792	42 0.00000435													
					1917.762	12 0.00000409													
					1917.731	82 0.00000411													
					1917.701	52 0.00000405													
					1917.671	21 0.00000408													
					1917.64	91 0.00000409													
					1917.61	61 0.00000403													
					1917.58	3 0.00000422													
					1917.55	4.34E-06													
					1917.508	33 0.00000454													
					1917.466	67 0.00000445													
					1917.425	4.53E-06													
					1917.383	33 0.00000449													
					1917.341	67 0.00000450													
					1917.3	4.14E-06													
					1917.258	33 0.00000402													
					1917.216	67 0.00000389													
					1917.175	3.9E-06													
					1917.133	33 0.00000401													
					1917.091	67 0.00000386													
					1917.05	4.01E-06													
					1917.008	33 0.00000383													
					1916.966	67 0.00000404													
					1916.925	4.09E-06													
					1916.883	33 0.00000393													
					1916.841	67 0.00000391													
					1916.8	3.91E-06													
					1916.758	33 0.00000405													
					1916.716	67 0.00000404													
					1916.675	4.3E-06													
					1916.633	33 0.00000417													
					1916.591	67 0.00000415													
					1916.55	4.26E-06													
					1916.515	52 0.00000425													
					1916.481	03 0.00000495													
					1916.446	55 0.00000572													
					1916.412	07 0.00000501													
					1916.377	59 0.00000471													
					1916.343	1 0.00000460													
					1916.308	62 0.00000496													
					1916.274	14 0.00000457													
					1916.239	66 0.00000422													
					1916.205	17 0.00000436													
					1916.17	69 0.00000410													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Linsley, 2000a	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1916.136	21	0.00000415													
					1916.101	72	0.00000399													
					1916.067	24	0.00000401													
					1916.032	76	0.00000394													
					1915.998	28	0.00000390													
					1915.963	79	0.00000379													
					1915.929	31	0.00000377													
					1915.894	83	0.00000382													
					1915.86	34	0.00000382													
					1915.825	86	0.00000385													
					1915.791	38	0.00000383													
					1915.756	9	0.00000372													
					1915.722	41	0.00000358													
					1915.687	93	0.00000350													
					1915.653	45	0.00000378													
					1915.618	97	0.00000390													
					1915.584	48	0.00000392													
					1915.55		4.05E-06													
					1915.527	78	0.00000394													
					1915.505	56	0.00000404													
					1915.483	33	0.00000405													
					1915.461	11	0.00000399													
					1915.438	89	0.00000397													
					1915.416	67	0.00000394													
					1915.394	44	0.00000394													
					1915.372	22	0.00000394													
					1915.35		4.06E-06													
					1915.327	78	0.00000397													
					1915.305	56	0.00000399													
					1915.283	33	0.00000407													
					1915.261	11	0.00000394													
					1915.238	89	0.00000393													
					1915.216	67	0.00000382													
					1915.194	44	0.00000390													
					1915.172	22	0.00000380													
					1915.15		3.77E-06													
					1915.127	78	0.00000377													
					1915.105	56	0.00000364													
					1915.083	33	0.00000354													
					1915.061	11	0.00000348													
					1915.038	89	0.00000344													
					1915.016	67	0.00000361													
					1914.994	44	0.00000370													
					1914.972	22	0.00000382													
					1914.95		3.84E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1914.927	78	0.00000381												
					1914.905	56	0.00000375												
					1914.883	33	0.00000384												
					1914.861	11	0.00000384												
					1914.838	89	0.00000385												
					1914.816	67	0.00000410												
					1914.794	44	0.00000417												
					1914.772	22	0.00000394												
					1914.75		3.97E-06												
					1914.727	78	0.00000372												
					1914.705	56	0.00000370												
					1914.683	33	0.00000387												
					1914.661	11	0.00000377												
					1914.638	89	0.00000388												
					1914.616	67	0.00000401												
					1914.594	44	0.00000407												
					1914.572	22	0.00000398												
					1914.55		4.07E-06												
					1914.525		4.05E-06												
					1914.5		4.14E-06												
					1914.475		4.23E-06												
					1914.45		4.18E-06												
					1914.425		4.25E-06												
					1914.4		4.27E-06												
					1914.375		4.42E-06												
					1914.35		4.22E-06												
					1914.325		4.28E-06												
					1914.3		4.46E-06												
					1914.275		4.33E-06												
					1914.25		4.41E-06												
					1914.225		4.53E-06												
					1914.2		4.74E-06												
					1914.175		4.74E-06												
					1914.15		4.38E-06												
					1914.125		4.3E-06												
					1914.1		4.28E-06												
					1914.075		4.28E-06												
					1914.05		4.16E-06												
					1914.025		0.000004												
					1914		4.17E-06												
					1913.975		3.95E-06												
					1913.95		3.97E-06												
					1913.925		3.91E-06												
					1913.9		3.76E-06												
					1913.875		3.67E-06												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1913.85	3.63E-06													
					1913.825	3.8E-06													
					1913.8	3.77E-06													
					1913.775	4.02E-06													
					1913.75	4.03E-06													
					1913.725	4.12E-06													
					1913.7	4.09E-06													
					1913.675	3.93E-06													
					1913.65	4.01E-06													
					1913.625	3.86E-06													
					1913.6	0.000004													
					1913.575	4.21E-06													
					1913.55	4.16E-06													
					1913.526	19 0.00000413													
					1913.502	38 0.00000415													
					1913.478	57 0.00000429													
					1913.454	76 0.00000425													
					1913.43	95 0.00000421													
					1913.407	14 0.00000419													
					1913.383	33 0.00000427													
					1913.359	52 0.00000446													
					1913.335	71 0.00000433													
					1913.311	9 0.00000510													
					1913.288	1 0.00000527													
					1913.264	29 0.00000525													
					1913.24	48 0.00000475													
					1913.216	67 0.00000437													
					1913.192	86 0.00000430													
					1913.169	05 0.00000424													
					1913.145	24 0.00000397													
					1913.121	43 0.00000396													
					1913.097	62 0.00000381													
					1913.073	81 0.00000377													
					1913.05	3.86E-06													
					1913.026	19 0.00000386													
					1913.002	38 0.00000394													
					1912.978	57 0.00000373													
					1912.954	76 0.00000380													
					1912.93	95 0.00000368													
					1912.907	14 0.00000427													
					1912.883	33 0.00000377													
					1912.859	52 0.00000394													
					1912.835	71 0.00000406													
					1912.811	9 0.00000400													
					1912.788	1 0.00000389													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1912.764	29 0.00000388													
					1912.74	48 0.00000398													
					1912.716	67 0.00000404													
					1912.692	86 0.00000407													
					1912.669	05 0.00000423													
					1912.645	24 0.00000420													
					1912.621	43 0.00000441													
					1912.597	62 0.00000450													
					1912.573	81 0.00000432													
					1912.55	4.4E-06													
					1912.524	36 0.00000428													
					1912.498	72 0.00000435													
					1912.473	08 0.00000430													
					1912.447	44 0.00000426													
					1912.421	79 0.00000409													
					1912.396	15 0.00000387													
					1912.37	51 0.00000406													
					1912.344	87 0.00000394													
					1912.319	23 0.00000393													
					1912.293	59 0.00000393													
					1912.267	95 0.00000392													
					1912.242	31 0.00000380													
					1912.216	67 0.00000398													
					1912.191	03 0.00000418													
					1912.165	38 0.00000408													
					1912.139	74 0.00000404													
					1912.114	1 0.00000413													
					1912.088	46 0.00000395													
					1912.062	82 0.00000387													
					1912.037	18 0.00000401													
					1912.011	54 0.00000387													
					1911.985	9 0.00000406													
					1911.96	26 0.00000405													
					1911.934	62 0.00000411													
					1911.908	97 0.00000423													
					1911.883	33 0.00000430													
					1911.857	69 0.00000390													
					1911.832	05 0.00000396													
					1911.806	41 0.00000432													
					1911.78	77 0.00000461													
					1911.755	13 0.00000487													
					1911.729	49 0.00000489													
					1911.703	85 0.00000521													
					1911.678	21 0.00000518													
					1911.652	56 0.00000506													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1911.626	92 0.00000480													
					1911.601	28 0.00000497													
					1911.575	64 0.00000509													
					1911.55	4.92E-06													
					1911.522	22 0.00000475													
					1911.494	44 0.00000511													
					1911.466	67 0.00000504													
					1911.438	89 0.00000513													
					1911.411	11 0.00000539													
					1911.383	33 0.00000588													
					1911.355	56 0.00000635													
					1911.327	78 0.00000724													
					1911.3	7.54E-06													
					1911.272	22 0.00000692													
					1911.244	44 0.00000642													
					1911.216	67 0.00000576													
					1911.188	89 0.00000507													
					1911.161	11 0.00000493													
					1911.133	33 0.00000479													
					1911.105	56 0.00000522													
					1911.077	78 0.00000470													
					1911.05	4.52E-06													
					1911.022	22 0.00000424													
					1910.994	44 0.00000432													
					1910.966	67 0.00000430													
					1910.938	89 0.00000442													
					1910.911	11 0.00000436													
					1910.883	33 0.00000442													
					1910.855	56 0.00000425													
					1910.827	78 0.00000435													
					1910.8	4.36E-06													
					1910.772	22 0.00000464													
					1910.744	44 0.00000451													
					1910.716	67 0.00000437													
					1910.688	89 0.00000454													
					1910.661	11 0.00000457													
					1910.633	33 0.00000450													
					1910.605	56 0.00000459													
					1910.577	78 0.00000465													
					1910.55	4.62E-06													
					1910.527	27 0.00000432													
					1910.504	55 0.00000412													
					1910.481	82 0.00000477													
					1910.459	09 0.00000507													
					1910.436	36 0.00000485													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1910.413	64 0.00000458													
					1910.39	91 0.00000494													
					1910.368	18 0.00000581													
					1910.345	45 0.00000623													
					1910.322	73 0.00000718													
					1910.3	5.54E-06													
					1910.277	27 0.00000520													
					1910.254	55 0.00000526													
					1910.231	82 0.00000586													
					1910.209	09 0.00000664													
					1910.186	36 0.00000653													
					1910.163	64 0.00000564													
					1910.14	91 0.00000451													
					1910.118	18 0.00000425													
					1910.095	45 0.00000412													
					1910.072	73 0.00000431													
					1910.05	4.05E-06													
					1910.027	27 0.00000425													
					1910.004	55 0.00000401													
					1909.981	82 0.00000378													
					1909.959	09 0.00000423													
					1909.936	36 0.00000423													
					1909.913	64 0.00000409													
					1909.89	91 0.00000400													
					1909.868	18 0.00000407													
					1909.845	45 0.00000423													
					1909.822	73 0.00000391													
					1909.8	3.88E-06													
					1909.777	27 0.00000383													
					1909.754	55 0.00000388													
					1909.731	82 0.00000372													
					1909.709	09 0.00000366													
					1909.686	36 0.00000375													
					1909.663	64 0.00000422													
					1909.64	91 0.00000380													
					1909.618	18 0.00000364													
					1909.595	45 0.00000369													
					1909.572	73 0.00000377													
					1909.55	3.87E-06													
					1909.524	36 0.00000384													
					1909.498	72 0.00000393													
					1909.473	08 0.00000392													
					1909.447	44 0.00000411													
					1909.421	79 0.00000434													
					1909.396	15 0.00000453													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1909.37	51 0.00000438													
					1909.344	87 0.00000420													
					1909.319	23 0.00000422													
					1909.293	59 0.00000420													
					1909.267	95 0.00000445													
					1909.242	31 0.00000417													
					1909.216	67 0.00000402													
					1909.191	03 0.00000397													
					1909.165	38 0.00000430													
					1909.139	74 0.00000397													
					1909.114	1 0.00000399													
					1909.088	46 0.00000409													
					1909.062	82 0.00000404													
					1909.037	18 0.00000401													
					1909.011	54 0.00000392													
					1908.985	9 0.00000400													
					1908.96	26 0.00000378													
					1908.934	62 0.00000380													
					1908.908	97 0.00000386													
					1908.883	33 0.00000404													
					1908.857	69 0.00000393													
					1908.832	05 0.00000377													
					1908.806	41 0.00000383													
					1908.78	77 0.00000374													
					1908.755	13 0.00000362													
					1908.729	49 0.00000366													
					1908.703	85 0.00000384													
					1908.678	21 0.00000377													
					1908.652	56 0.00000397													
					1908.626	92 0.00000396													
					1908.601	28 0.00000413													
					1908.575	64 0.00000432													
					1908.55	4.12E-06													
					1908.522	97 0.00000411													
					1908.495	95 0.00000411													
					1908.468	92 0.00000421													
					1908.441	89 0.00000417													
					1908.414	86 0.00000435													
					1908.387	84 0.00000478													
					1908.36	81 0.00000447													
					1908.333	78 0.00000427													
					1908.306	76 0.00000445													
					1908.279	73 0.00000430													
					1908.252	7 0.00000479													
					1908.225	68 0.00000495													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1908.198	65	0.00000505													
					1908.171	62	0.00000510													
					1908.144	59	0.00000494													
					1908.117	57	0.00000458													
					1908.09	54	0.00000403													
					1908.063	51	0.00000401													
					1908.036	49	0.00000429													
					1908.009	46	0.00000417													
					1907.982	43	0.00000420													
					1907.955	41	0.00000418													
					1907.928	38	0.00000420													
					1907.901	35	0.00000428													
					1907.874	32	0.00000388													
					1907.847	3	0.00000369													
					1907.82	27	0.00000377													
					1907.793	24	0.00000400													
					1907.766	22	0.00000401													
					1907.739	19	0.00000420													
					1907.712	16	0.00000415													
					1907.685	14	0.00000400													
					1907.658	11	0.00000402													
					1907.631	08	0.00000414													
					1907.604	05	0.00000404													
					1907.577	03	0.00000407													
					1907.55		0.000004													
					1907.527	78	0.00000410													
					1907.505	56	0.00000411													
					1907.483	33	0.00000429													
					1907.461	11	0.00000449													
					1907.438	89	0.00000431													
					1907.416	67	0.00000469													
					1907.394	44	0.00000471													
					1907.372	22	0.00000470													
					1907.35		4.62E-06													
					1907.327	78	0.00000458													
					1907.305	56	0.00000435													
					1907.283	33	0.00000447													
					1907.261	11	0.00000447													
					1907.238	89	0.00000466													
					1907.216	67	0.00000447													
					1907.194	44	0.00000439													
					1907.172	22	0.00000434													
					1907.15		4.16E-06													
					1907.127	78	0.00000432													
					1907.105	56	0.00000464													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1907.083	33 0.00000477													
					1907.061	11 0.00000472													
					1907.038	89 0.00000450													
					1907.016	67 0.00000427													
					1906.994	44 0.00000426													
					1906.972	22 0.00000452													
					1906.95	4.51E-06													
					1906.927	78 0.00000433													
					1906.905	56 0.00000435													
					1906.883	33 0.00000448													
					1906.861	11 0.00000418													
					1906.838	89 0.00000411													
					1906.816	67 0.00000420													
					1906.794	44 0.00000403													
					1906.772	22 0.00000388													
					1906.75	3.97E-06													
					1906.727	78 0.00000420													
					1906.705	56 0.00000394													
					1906.683	33 0.00000413													
					1906.661	11 0.00000417													
					1906.638	89 0.00000438													
					1906.616	67 0.00000439													
					1906.594	44 0.00000408													
					1906.572	22 0.00000392													
					1906.55	3.95E-06													
					1906.529	59 0.00000411													
					1906.509	18 0.00000400													
					1906.488	78 0.00000424													
					1906.468	37 0.00000435													
					1906.447	96 0.00000457													
					1906.427	55 0.00000478													
					1906.407	14 0.00000503													
					1906.386	73 0.00000595													
					1906.366	33 0.00000563													
					1906.345	92 0.00000522													
					1906.325	51 0.00000580													
					1906.305	1 0.00000625													
					1906.284	69 0.00000672													
					1906.264	29 0.00000736													
					1906.243	88 0.00000747													
					1906.223	47 0.00000743													
					1906.203	06 0.00000750													
					1906.182	65 0.00000682													
					1906.162	24 0.00000593													
					1906.141	84 0.00000470													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1906.121	43 0.00000435													
					1906.101	02 0.00000422													
					1906.08	61 0.00000403													
					1906.06	2 0.00000374													
					1906.039	8 0.00000380													
					1906.019	39 0.00000385													
					1905.998	98 0.00000417													
					1905.978	57 0.00000403													
					1905.958	16 0.00000399													
					1905.937	76 0.00000390													
					1905.917	35 0.00000376													
					1905.896	94 0.00000390													
					1905.876	53 0.00000380													
					1905.856	12 0.00000368													
					1905.835	71 0.00000386													
					1905.815	31 0.00000388													
					1905.794	9 0.00000395													
					1905.774	49 0.00000385													
					1905.754	08 0.00000395													
					1905.733	67 0.00000400													
					1905.713	27 0.00000416													
					1905.692	86 0.00000404													
					1905.672	45 0.00000411													
					1905.652	04 0.00000415													
					1905.631	63 0.00000416													
					1905.611	22 0.00000403													
					1905.59	82 0.00000404													
					1905.57	41 0.00000434													
					1905.55	4.39E-06													
					1905.526	19 0.00000461													
					1905.502	38 0.00000496													
					1905.478	57 0.00000429													
					1905.454	76 0.00000426													
					1905.43	95 0.00000442													
					1905.407	14 0.00000471													
					1905.383	33 0.00000448													
					1905.359	52 0.00000453													
					1905.335	71 0.00000440													
					1905.311	9 0.00000453													
					1905.288	1 0.00000465													
					1905.264	29 0.00000446													
					1905.24	48 0.00000439													
					1905.216	67 0.00000434													
					1905.192	86 0.00000401													
					1905.169	05 0.00000375													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1905.145	24	0.00000411												
					1905.121	43	0.00000422												
					1905.097	62	0.00000430												
					1905.073	81	0.00000418												
					1905.05		3.99E-06												
					1905.026	19	0.00000407												
					1905.002	38	0.00000388												
					1904.978	57	0.00000384												
					1904.954	76	0.00000380												
					1904.93	95	0.00000381												
					1904.907	14	0.00000396												
					1904.883	33	0.00000393												
					1904.859	52	0.00000399												
					1904.835	71	0.00000391												
					1904.811	9	0.00000393												
					1904.788	1	0.00000400												
					1904.764	29	0.00000392												
					1904.74	48	0.00000383												
					1904.716	67	0.00000381												
					1904.692	86	0.00000384												
					1904.669	05	0.00000366												
					1904.645	24	0.00000386												
					1904.621	43	0.00000386												
					1904.597	62	0.00000391												
					1904.573	81	0.00000396												
					1904.55		3.87E-06												
					1904.527	27	0.00000363												
					1904.504	55	0.00000419												
					1904.481	82	0.00000421												
					1904.459	09	0.00000410												
					1904.436	36	0.00000425												
					1904.413	64	0.00000427												
					1904.39	91	0.00000451												
					1904.368	18	0.00000441												
					1904.345	45	0.00000417												
					1904.322	73	0.00000425												
					1904.3		3.94E-06												
					1904.277	27	0.00000403												
					1904.254	55	0.00000390												
					1904.231	82	0.00000381												
					1904.209	09	0.00000387												
					1904.186	36	0.00000394												
					1904.163	64	0.00000443												
					1904.14	91	0.00000420												
					1904.118	18	0.00000414												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1904.095	45 0.00000450													
					1904.072	73 0.00000447													
					1904.05	4.2E-06													
					1904.027	27 0.00000402													
					1904.004	55 0.00000407													
					1903.981	82 0.00000413													
					1903.959	09 0.00000400													
					1903.936	36 0.00000380													
					1903.913	64 0.00000400													
					1903.89	91 0.00000416													
					1903.868	18 0.00000397													
					1903.845	45 0.00000398													
					1903.822	73 0.00000395													
					1903.8	3.93E-06													
					1903.777	27 0.00000417													
					1903.754	55 0.00000397													
					1903.731	82 0.00000399													
					1903.709	09 0.00000395													
					1903.686	36 0.00000411													
					1903.663	64 0.00000401													
					1903.64	91 0.00000435													
					1903.618	18 0.00000430													
					1903.595	45 0.00000440													
					1903.572	73 0.00000421													
					1903.55	4.56E-06													
					1903.526	19 0.00000449													
					1903.502	38 0.00000433													
					1903.478	57 0.00000440													
					1903.454	76 0.00000450													
					1903.43	95 0.00000442													
					1903.407	14 0.00000429													
					1903.383	33 0.00000458													
					1903.359	52 0.00000430													
					1903.335	71 0.00000426													
					1903.311	9 0.00000478													
					1903.288	1 0.00000467													
					1903.264	29 0.00000502													
					1903.24	48 0.00000548													
					1903.216	67 0.00000618													
					1903.192	86 0.00000650													
					1903.169	05 0.00000637													
					1903.145	24 0.00000584													
					1903.121	43 0.00000497													
					1903.097	62 0.00000423													
					1903.073	81 0.00000437													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1903.05	4.32E-06													
					1903.026	19 0.00000426													
					1903.002	38 0.00000417													
					1902.978	57 0.00000417													
					1902.954	76 0.00000417													
					1902.93	95 0.00000398													
					1902.907	14 0.00000381													
					1902.883	33 0.00000387													
					1902.859	52 0.00000408													
					1902.835	71 0.00000418													
					1902.811	9 0.00000430													
					1902.788	1 0.00000426													
					1902.764	29 0.00000407													
					1902.74	48 0.00000403													
					1902.716	67 0.00000398													
					1902.692	86 0.00000376													
					1902.669	05 0.00000363													
					1902.645	24 0.00000373													
					1902.621	43 0.00000399													
					1902.597	62 0.00000383													
					1902.573	81 0.00000386													
					1902.55	4.28E-06													
					1902.518	75 0.00000418													
					1902.487	5 0.00000421													
					1902.456	25 0.00000394													
					1902.425	4.15E-06													
					1902.393	75 0.00000432													
					1902.362	5 0.00000374													
					1902.331	25 0.00000372													
					1902.3	3.73E-06													
					1902.268	75 0.00000393													
					1902.237	5 0.00000395													
					1902.206	25 0.00000399													
					1902.175	3.93E-06													
					1902.143	75 0.00000380													
					1902.112	5 0.00000381													
					1902.081	25 0.00000371													
					1902.05	3.72E-06													
					1902.018	75 0.00000352													
					1901.987	5 0.00000372													
					1901.956	25 0.00000379													
					1901.925	3.67E-06													
					1901.893	75 0.00000372													
					1901.862	5 0.00000377													
					1901.831	25 0.00000402													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1901.8	0.000004													
					1901.768	75 0.00000388													
					1901.737	5 0.00000392													
					1901.706	25 0.00000397													
					1901.675	0.000004													
					1901.643	75 0.00000398													
					1901.612	5 0.00000420													
					1901.581	25 0.00000404													
					1901.55	4.36E-06													
					1901.519	7 0.00000444													
					1901.489	39 0.00000427													
					1901.459	09 0.00000399													
					1901.428	79 0.00000399													
					1901.398	48 0.00000417													
					1901.368	18 0.00000422													
					1901.337	88 0.00000416													
					1901.307	58 0.00000413													
					1901.277	27 0.00000406													
					1901.246	97 0.00000418													
					1901.216	67 0.00000451													
					1901.186	36 0.00000469													
					1901.156	06 0.00000471													
					1901.125	76 0.00000507													
					1901.095	45 0.00000499													
					1901.065	15 0.00000496													
					1901.034	85 0.00000496													
					1901.004	55 0.00000492													
					1900.974	24 0.00000437													
					1900.943	94 0.00000405													
					1900.913	64 0.00000365													
					1900.883	33 0.00000361													
					1900.853	03 0.00000358													
					1900.822	73 0.00000357													
					1900.792	42 0.00000362													
					1900.762	12 0.00000390													
					1900.731	82 0.00000400													
					1900.701	52 0.00000406													
					1900.671	21 0.00000406													
					1900.64	91 0.00000398													
					1900.61	61 0.00000394													
					1900.58	3 0.00000394													
					1900.55	3.86E-06													
					1900.527	27 0.00000371													
					1900.504	55 0.00000386													
					1900.481	82 0.00000365													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1900.459	09 0.00000362													
					1900.436	36 0.00000398													
					1900.413	64 0.00000385													
					1900.39	91 0.00000385													
					1900.368	18 0.00000401													
					1900.345	45 0.00000392													
					1900.322	73 0.00000394													
					1900.3	3.99E-06													
					1900.277	27 0.00000420													
					1900.254	55 0.00000417													
					1900.231	82 0.00000388													
					1900.209	09 0.00000406													
					1900.186	36 0.00000426													
					1900.163	64 0.00000420													
					1900.14	91 0.00000399													
					1900.118	18 0.00000381													
					1900.095	45 0.00000388													
					1900.072	73 0.00000407													
					1900.05	4.31E-06													
					1900.027	27 0.00000435													
					1900.004	55 0.00000458													
					1899.981	82 0.00000464													
					1899.959	09 0.00000440													
					1899.936	36 0.00000415													
					1899.913	64 0.00000401													
					1899.89	91 0.00000397													
					1899.868	18 0.00000388													
					1899.845	45 0.00000409													
					1899.822	73 0.00000402													
					1899.8	0.000004													
					1899.777	27 0.00000391													
					1899.754	55 0.00000376													
					1899.731	82 0.00000370													
					1899.709	09 0.00000364													
					1899.686	36 0.00000371													
					1899.663	64 0.00000390													
					1899.64	91 0.00000398													
					1899.618	18 0.00000431													
					1899.595	45 0.00000435													
					1899.572	73 0.00000434													
					1899.55	4.6E-06													
					1899.526	74 0.00000447													
					1899.503	49 0.00000442													
					1899.48	23 0.00000432													
					1899.456	98 0.00000406													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1899.433	72 0.00000398													
					1899.41	47 0.00000456													
					1899.387	21 0.00000462													
					1899.363	95 0.00000483													
					1899.34	7 0.00000547													
					1899.317	44 0.00000543													
					1899.294	19 0.00000567													
					1899.27	93 0.00000571													
					1899.247	67 0.00000583													
					1899.224	42 0.00000604													
					1899.201	16 0.00000600													
					1899.177	91 0.00000579													
					1899.154	65 0.00000499													
					1899.131	4 0.00000469													
					1899.108	14 0.00000407													
					1899.084	88 0.00000409													
					1899.061	63 0.00000400													
					1899.038	37 0.00000417													
					1899.015	12 0.00000424													
					1898.991	86 0.00000432													
					1898.968	6 0.00000442													
					1898.945	35 0.00000436													
					1898.922	09 0.00000426													
					1898.898	84 0.00000431													
					1898.875	58 0.00000434													
					1898.852	33 0.00000423													
					1898.829	07 0.00000427													
					1898.805	81 0.00000443													
					1898.782	56 0.00000458													
					1898.759	3 0.00000453													
					1898.736	05 0.00000472													
					1898.712	79 0.00000454													
					1898.689	53 0.00000449													
					1898.666	28 0.00000457													
					1898.643	02 0.00000447													
					1898.619	77 0.00000481													
					1898.596	51 0.00000471													
					1898.573	26 0.00000445													
					1898.55	4.58E-06													
					1898.53	39 0.00000460													
					1898.51	78 0.00000516													
					1898.491	18 0.00000498													
					1898.471	57 0.00000471													
					1898.451	96 0.00000482													
					1898.432	35 0.00000504													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1898.412	75	0.00000510													
					1898.393	14	0.00000484													
					1898.373	53	0.00000528													
					1898.353	92	0.00000499													
					1898.334	31	0.00000481													
					1898.314	71	0.00000523													
					1898.295	1	0.00000517													
					1898.275	49	0.00000520													
					1898.255	88	0.00000602													
					1898.236	27	0.00000612													
					1898.216	67	0.00000656													
					1898.197	06	0.00000659													
					1898.177	45	0.00000550													
					1898.157	84	0.00000530													
					1898.138	24	0.00000539													
					1898.118	63	0.00000513													
					1898.099	02	0.00000505													
					1898.079	41	0.00000462													
					1898.059	8	0.00000430													
					1898.04	2	0.00000434													
					1898.02	59	0.00000438													
					1898	98	0.00000406													
					1897.981	37	0.00000402													
					1897.961	76	0.00000417													
					1897.942	16	0.00000421													
					1897.922	55	0.00000439													
					1897.902	94	0.00000449													
					1897.883	33	0.00000431													
					1897.863	73	0.00000430													
					1897.844	12	0.00000429													
					1897.824	51	0.00000415													
					1897.804	9	0.00000417													
					1897.785	29	0.00000422													
					1897.765	69	0.00000401													
					1897.746	08	0.00000412													
					1897.726	47	0.00000411													
					1897.706	86	0.00000428													
					1897.687	25	0.00000417													
					1897.667	65	0.00000410													
					1897.648	04	0.00000409													
					1897.628	43	0.00000447													
					1897.608	82	0.00000426													
					1897.589	22	0.00000425													
					1897.569	61	0.00000452													
					1897.55		4.25E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1897.532	46	0.00000438													
					1897.514	91	0.00000428													
					1897.497	37	0.00000426													
					1897.479	82	0.00000429													
					1897.462	28	0.00000450													
					1897.444	74	0.00000445													
					1897.427	19	0.00000457													
					1897.409	65	0.00000484													
					1897.392	11	0.00000471													
					1897.374	56	0.00000454													
					1897.357	02	0.00000470													
					1897.339	47	0.00000460													
					1897.321	93	0.00000468													
					1897.304	39	0.00000464													
					1897.286	84	0.00000479													
					1897.269	3	0.00000486													
					1897.251	75	0.00000472													
					1897.234	21	0.00000462													
					1897.216	67	0.00000444													
					1897.199	12	0.00000416													
					1897.181	58	0.00000474													
					1897.164	04	0.00000496													
					1897.146	49	0.00000475													
					1897.128	95	0.00000476													
					1897.111	4	0.00000464													
					1897.093	86	0.00000465													
					1897.076	32	0.00000484													
					1897.058	77	0.00000490													
					1897.041	23	0.00000514													
					1897.023	68	0.00000481													
					1897.006	14	0.00000485													
					1896.988	6	0.00000480													
					1896.971	05	0.00000443													
					1896.953	51	0.00000479													
					1896.935	96	0.00000487													
					1896.918	42	0.00000483													
					1896.9	88	0.00000509													
					1896.883	33	0.00000497													
					1896.865	79	0.00000497													
					1896.848	25	0.00000485													
					1896.83	7	0.00000480													
					1896.813	16	0.00000445													
					1896.795	61	0.00000447													
					1896.778	07	0.00000458													
					1896.76	53	0.00000453													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1896.742	98 0.00000446													
					1896.725	44 0.00000451													
					1896.707	89 0.00000433													
					1896.69	35 0.00000432													
					1896.672	81 0.00000446													
					1896.655	26 0.00000418													
					1896.637	72 0.00000435													
					1896.62	18 0.00000389													
					1896.602	63 0.00000409													
					1896.585	09 0.00000441													
					1896.567	54 0.00000460													
					1896.55	4.64E-06													
					1896.533	61 0.00000452													
					1896.517	21 0.00000464													
					1896.5	82 0.00000511													
					1896.484	43 0.00000515													
					1896.468	03 0.00000435													
					1896.451	64 0.00000516													
					1896.435	25 0.00000491													
					1896.418	85 0.00000524													
					1896.402	46 0.00000578													
					1896.386	07 0.00000550													
					1896.369	67 0.00000549													
					1896.353	28 0.00000566													
					1896.336	89 0.00000582													
					1896.32	49 0.00000607													
					1896.304	1 0.00000517													
					1896.287	7 0.00000551													
					1896.271	31 0.00000569													
					1896.254	92 0.00000619													
					1896.238	52 0.00000850													
					1896.222	13 0.00001007													
					1896.205	74 0.00001021													
					1896.189	34 0.00000879													
					1896.172	95 0.00000861													
					1896.156	56 0.00000741													
					1896.14	16 0.00000672													
					1896.123	77 0.00000496													
					1896.107	38 0.00000455													
					1896.09	98 0.00000395													
					1896.074	59 0.00000360													
					1896.058	2 0.00000371													
					1896.041	8 0.00000386													
					1896.025	41 0.00000400													
					1896.009	02 0.00000399													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1895.992	62 0.00000381													
					1895.976	23 0.00000384													
					1895.959	84 0.00000396													
					1895.943	44 0.00000377													
					1895.927	05 0.00000384													
					1895.91	66 0.00000398													
					1895.894	26 0.00000409													
					1895.877	87 0.00000393													
					1895.861	48 0.00000406													
					1895.845	08 0.00000381													
					1895.828	69 0.00000386													
					1895.812	3 0.00000382													
					1895.795	9 0.00000387													
					1895.779	51 0.00000375													
					1895.763	11 0.00000379													
					1895.746	72 0.00000412													
					1895.73	33 0.00000406													
					1895.713	93 0.00000395													
					1895.697	54 0.00000409													
					1895.681	15 0.00000403													
					1895.664	75 0.00000411													
					1895.648	36 0.00000423													
					1895.631	97 0.00000423													
					1895.615	57 0.00000407													
					1895.599	18 0.00000456													
					1895.582	79 0.00000418													
					1895.566	39 0.00000416													
					1895.55	4.45E-06													
					1895.537	01 0.00000444													
					1895.524	03 0.00000432													
					1895.511	04 0.00000484													
					1895.498	05 0.00000427													
					1895.485	06 0.00000444													
					1895.472	08 0.00000455													
					1895.459	09 0.00000479													
					1895.446	1 0.00000497													
					1895.433	12 0.00000580													
					1895.42	13 0.00000638													
					1895.407	14 0.00000618													
					1895.394	16 0.00000521													
					1895.381	17 0.00000509													
					1895.368	18 0.00000459													
					1895.355	19 0.00000445													
					1895.342	21 0.00000444													
					1895.329	22 0.00000449													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1895.316	23	0.00000446												
					1895.303	25	0.00000456												
					1895.29	26	0.00000459												
					1895.277	27	0.00000461												
					1895.264	29	0.00000444												
					1895.251	3	0.00000457												
					1895.238	31	0.00000447												
					1895.225	32	0.00000466												
					1895.212	34	0.00000458												
					1895.199	35	0.00000454												
					1895.186	36	0.00000446												
					1895.173	38	0.00000465												
					1895.16	39	0.00000462												
					1895.147	4	0.00000516												
					1895.134	42	0.00000564												
					1895.121	43	0.00000571												
					1895.108	44	0.00000504												
					1895.095	45	0.00000508												
					1895.082	47	0.00000576												
					1895.069	48	0.00000682												
					1895.056	49	0.00000716												
					1895.043	51	0.00000644												
					1895.03	52	0.00000652												
					1895.017	53	0.00000697												
					1895.004	55	0.00000758												
					1894.991	56	0.00000748												
					1894.978	57	0.00000556												
					1894.965	58	0.00000527												
					1894.952	6	0.00000424												
					1894.939	61	0.00000529												
					1894.926	62	0.00000440												
					1894.913	64	0.00000418												
					1894.9	65	0.00000412												
					1894.887	66	0.00000452												
					1894.874	68	0.00000394												
					1894.861	69	0.00000433												
					1894.848	7	0.00000427												
					1894.835	71	0.00000429												
					1894.822	73	0.00000407												
					1894.809	74	0.00000388												
					1894.796	75	0.00000407												
					1894.783	77	0.00000414												
					1894.77	78	0.00000415												
					1894.757	79	0.00000407												
					1894.744	81	0.00000413												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1894.731	82 0.00000404													
					1894.718	83 0.00000404													
					1894.705	84 0.00000432													
					1894.692	86 0.00000435													
					1894.679	87 0.00000446													
					1894.666	88 0.00000426													
					1894.653	9 0.00000392													
					1894.64	91 0.00000434													
					1894.627	92 0.00000429													
					1894.614	94 0.00000482													
					1894.601	95 0.00000473													
					1894.588	96 0.00000453													
					1894.575	97 0.00000469													
					1894.562	99 0.00000468													
					1894.55	4.66E-06													
					1894.533	61 0.00000464													
					1894.517	21 0.00000538													
					1894.5	82 0.00000607													
					1894.484	43 0.00000716													
					1894.468	03 0.00000727													
					1894.451	64 0.00000660													
					1894.435	25 0.00000530													
					1894.418	85 0.00000566													
					1894.402	46 0.00000563													
					1894.386	07 0.00000557													
					1894.369	67 0.00000610													
					1894.353	28 0.00000631													
					1894.336	89 0.00000609													
					1894.32	49 0.00000629													
					1894.304	1 0.00000619													
					1894.287	7 0.00000723													
					1894.271	31 0.00000717													
					1894.254	92 0.00000690													
					1894.238	52 0.00000631													
					1894.222	13 0.00000667													
					1894.205	74 0.00000621													
					1894.189	34 0.00000496													
					1894.172	95 0.00000396													
					1894.156	56 0.00000421													
					1894.14	16 0.00000454													
					1894.123	77 0.00000423													
					1894.107	38 0.00000433													
					1894.09	98 0.00000384													
					1894.074	59 0.00000415													
					1894.058	2 0.00000401													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1894.041	8 0.00000387													
					1894.025	41 0.00000382													
					1894.009	02 0.00000388													
					1893.992	62 0.00000374													
					1893.976	23 0.00000389													
					1893.959	84 0.00000373													
					1893.943	44 0.00000380													
					1893.927	05 0.00000368													
					1893.91	66 0.00000389													
					1893.894	26 0.00000375													
					1893.877	87 0.00000374													
					1893.861	48 0.00000371													
					1893.845	08 0.00000362													
					1893.828	69 0.00000360													
					1893.812	3 0.00000377													
					1893.795	9 0.00000364													
					1893.779	51 0.00000370													
					1893.763	11 0.00000384													
					1893.746	72 0.00000377													
					1893.73	33 0.00000412													
					1893.713	93 0.00000373													
					1893.697	54 0.00000380													
					1893.681	15 0.00000372													
					1893.664	75 0.00000383													
					1893.648	36 0.00000380													
					1893.631	97 0.00000390													
					1893.615	57 0.00000391													
					1893.599	18 0.00000398													
					1893.582	79 0.00000384													
					1893.566	39 0.00000405													
					1893.55	4.16E-06													
					1893.53	4.19E-06													
					1893.51	4.63E-06													
					1893.49	4.24E-06													
					1893.47	4.4E-06													
					1893.45	4.48E-06													
					1893.43	4.47E-06													
					1893.41	4.66E-06													
					1893.39	4.79E-06													
					1893.37	4.45E-06													
					1893.35	4.59E-06													
					1893.33	4.34E-06													
					1893.31	4.24E-06													
					1893.29	4.35E-06													
					1893.27	4.4E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1893.25	4.44E-06													
					1893.23	4.36E-06													
					1893.21	3.98E-06													
					1893.19	3.86E-06													
					1893.17	3.77E-06													
					1893.15	3.76E-06													
					1893.13	3.85E-06													
					1893.11	3.77E-06													
					1893.09	3.81E-06													
					1893.07	3.7E-06													
					1893.05	3.65E-06													
					1893.03	3.85E-06													
					1893.01	3.77E-06													
					1892.99	3.84E-06													
					1892.97	3.8E-06													
					1892.95	3.69E-06													
					1892.93	3.72E-06													
					1892.91	3.85E-06													
					1892.89	3.76E-06													
					1892.87	3.85E-06													
					1892.85	3.76E-06													
					1892.83	3.65E-06													
					1892.81	3.68E-06													
					1892.79	3.82E-06													
					1892.77	3.54E-06													
					1892.75	3.52E-06													
					1892.73	3.47E-06													
					1892.71	3.72E-06													
					1892.69	3.38E-06													
					1892.67	3.03E-06													
					1892.65	3.77E-06													
					1892.63	4.03E-06													
					1892.61	3.8E-06													
					1892.59	3.74E-06													
					1892.57	3.95E-06													
					1892.55	3.83E-06													
					1892.528 72	0.00000374													
					1892.507 45	0.00000423													
					1892.486 17	0.00000412													
					1892.464 89	0.00000435													
					1892.443 62	0.00000421													
					1892.422 34	0.00000417													
					1892.401 06	0.00000413													
					1892.379 79	0.00000446													
					1892.358 51	0.00000426													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1892.337	23 0.00000408													
					1892.315	96 0.00000396													
					1892.294	68 0.00000402													
					1892.273	4 0.00000389													
					1892.252	13 0.00000380													
					1892.23	85 0.00000384													
					1892.209	57 0.00000389													
					1892.188	3 0.00000373													
					1892.167	02 0.00000362													
					1892.145	74 0.00000370													
					1892.124	47 0.00000391													
					1892.103	19 0.00000380													
					1892.081	91 0.00000382													
					1892.06	64 0.00000386													
					1892.039	36 0.00000415													
					1892.018	09 0.00000405													
					1891.996	81 0.00000409													
					1891.975	53 0.00000412													
					1891.954	26 0.00000402													
					1891.932	98 0.00000411													
					1891.911	7 0.00000390													
					1891.89	43 0.00000376													
					1891.869	15 0.00000376													
					1891.847	87 0.00000398													
					1891.826	6 0.00000394													
					1891.805	32 0.00000388													
					1891.784	04 0.00000363													
					1891.762	77 0.00000405													
					1891.741	49 0.00000402													
					1891.72	21 0.00000398													
					1891.698	94 0.00000413													
					1891.677	66 0.00000415													
					1891.656	38 0.00000426													
					1891.635	11 0.00000442													
					1891.613	83 0.00000433													
					1891.592	55 0.00000432													
					1891.571	28 0.00000427													
					1891.55	4.19E-06													
					1891.532	76 0.00000431													
					1891.515	52 0.00000442													
					1891.498	28 0.00000450													
					1891.481	03 0.00000464													
					1891.463	79 0.00000463													
					1891.446	55 0.00000474													
					1891.429	31 0.00000448													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1891.412	07 0.00000520													
					1891.394	83 0.00000500													
					1891.377	59 0.00000505													
					1891.36	34 0.00000518													
					1891.343	1 0.00000495													
					1891.325	86 0.00000519													
					1891.308	62 0.00000569													
					1891.291	38 0.00000558													
					1891.274	14 0.00000530													
					1891.256	9 0.00000545													
					1891.239	66 0.00000514													
					1891.222	41 0.00000505													
					1891.205	17 0.00000480													
					1891.187	93 0.00000431													
					1891.17	69 0.00000398													
					1891.153	45 0.00000392													
					1891.136	21 0.00000379													
					1891.118	97 0.00000380													
					1891.101	72 0.00000384													
					1891.084	48 0.00000359													
					1891.067	24 0.00000401													
					1891.05	4.08E-06													
					1891.032	76 0.00000416													
					1891.015	52 0.00000404													
					1890.998	28 0.00000378													
					1890.981	03 0.00000387													
					1890.963	79 0.00000384													
					1890.946	55 0.00000402													
					1890.929	31 0.00000382													
					1890.912	07 0.00000379													
					1890.894	83 0.00000383													
					1890.877	59 0.00000389													
					1890.86	34 0.00000397													
					1890.843	1 0.00000366													
					1890.825	86 0.00000372													
					1890.808	62 0.00000425													
					1890.791	38 0.00000473													
					1890.774	14 0.00000482													
					1890.756	9 0.00000502													
					1890.739	66 0.00000475													
					1890.722	41 0.00000490													
					1890.705	17 0.00000485													
					1890.687	93 0.00000484													
					1890.67	69 0.00000496													
					1890.653	45 0.00000522													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1890.636	21 0.00000532													
					1890.618	97 0.00000538													
					1890.601	72 0.00000557													
					1890.584	48 0.00000510													
					1890.567	24 0.00000506													
					1890.55	5.19E-06													
					1890.537	18 0.00000531													
					1890.524	36 0.00000495													
					1890.511	54 0.00000509													
					1890.498	72 0.00000500													
					1890.485	9 0.00000528													
					1890.473	08 0.00000524													
					1890.46	26 0.00000512													
					1890.447	44 0.00000474													
					1890.434	62 0.00000439													
					1890.421	79 0.00000457													
					1890.408	97 0.00000518													
					1890.396	15 0.00000562													
					1890.383	33 0.00000559													
					1890.37	51 0.00000601													
					1890.357	69 0.00000665													
					1890.344	87 0.00000584													
					1890.332	05 0.00000583													
					1890.319	23 0.00000601													
					1890.306	41 0.00000602													
					1890.293	59 0.00000585													
					1890.28	77 0.00000564													
					1890.267	95 0.00000544													
					1890.255	13 0.00000541													
					1890.242	31 0.00000540													
					1890.229	49 0.00000555													
					1890.216	67 0.00000570													
					1890.203	85 0.00000551													
					1890.191	03 0.00000527													
					1890.178	21 0.00000446													
					1890.165	38 0.00000439													
					1890.152	56 0.00000456													
					1890.139	74 0.00000432													
					1890.126	92 0.00000420													
					1890.114	1 0.00000428													
					1890.101	28 0.00000423													
					1890.088	46 0.00000430													
					1890.075	64 0.00000455													
					1890.062	82 0.00000450													
					1890.05	4.19E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1890.037	18 0.00000417													
					1890.024	36 0.00000391													
					1890.011	54 0.00000416													
					1889.998	72 0.00000401													
					1889.985	9 0.00000393													
					1889.973	08 0.00000406													
					1889.96	26 0.00000390													
					1889.947	44 0.00000395													
					1889.934	62 0.00000389													
					1889.921	79 0.00000389													
					1889.908	97 0.00000390													
					1889.896	15 0.00000382													
					1889.883	33 0.00000377													
					1889.87	51 0.00000393													
					1889.857	69 0.00000388													
					1889.844	87 0.00000370													
					1889.832	05 0.00000387													
					1889.819	23 0.00000361													
					1889.806	41 0.00000401													
					1889.793	59 0.00000379													
					1889.78	77 0.00000351													
					1889.767	95 0.00000366													
					1889.755	13 0.00000366													
					1889.742	31 0.00000372													
					1889.729	49 0.00000368													
					1889.716	67 0.00000425													
					1889.703	85 0.00000427													
					1889.691	03 0.00000415													
					1889.678	21 0.00000420													
					1889.665	38 0.00000383													
					1889.652	56 0.00000377													
					1889.639	74 0.00000399													
					1889.626	92 0.00000420													
					1889.614	1 0.00000391													
					1889.601	28 0.00000380													
					1889.588	46 0.00000414													
					1889.575	64 0.00000396													
					1889.562	82 0.00000418													
					1889.55	4.33E-06													
					1889.53	4.35E-06													
					1889.51	4.37E-06													
					1889.49	0.000004													
					1889.47	4.17E-06													
					1889.45	4.14E-06													
					1889.43	4.2E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1889.41	4.07E-06													
					1889.39	3.97E-06													
					1889.37	3.91E-06													
					1889.35	3.87E-06													
					1889.33	3.77E-06													
					1889.31	3.77E-06													
					1889.29	3.82E-06													
					1889.27	3.86E-06													
					1889.25	3.87E-06													
					1889.23	3.79E-06													
					1889.21	3.71E-06													
					1889.19	3.63E-06													
					1889.17	3.63E-06													
					1889.15	3.72E-06													
					1889.13	3.7E-06													
					1889.11	3.68E-06													
					1889.09	3.75E-06													
					1889.07	3.88E-06													
					1889.05	3.84E-06													
					1889.03	3.77E-06													
					1889.01	3.77E-06													
					1888.99	3.72E-06													
					1888.97	3.86E-06													
					1888.95	3.8E-06													
					1888.93	3.75E-06													
					1888.91	3.67E-06													
					1888.89	3.73E-06													
					1888.87	3.8E-06													
					1888.85	3.81E-06													
					1888.83	3.85E-06													
					1888.81	3.72E-06													
					1888.79	3.72E-06													
					1888.77	3.65E-06													
					1888.75	3.57E-06													
					1888.73	3.66E-06													
					1888.71	3.79E-06													
					1888.69	3.8E-06													
					1888.67	3.86E-06													
					1888.65	3.91E-06													
					1888.63	4.27E-06													
					1888.61	4.31E-06													
					1888.59	4.19E-06													
					1888.57	4.13E-06													
					1888.55	4.04E-06													
					1888.523	68 0.00000380													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1888.497	37 0.00000359													
					1888.471	05 0.00000387													
					1888.444	74 0.00000407													
					1888.418	42 0.00000402													
					1888.392	11 0.00000400													
					1888.365	79 0.00000412													
					1888.339	47 0.00000411													
					1888.313	16 0.00000412													
					1888.286	84 0.00000410													
					1888.26	53 0.00000410													
					1888.234	21 0.00000381													
					1888.207	89 0.00000383													
					1888.181	58 0.00000386													
					1888.155	26 0.00000356													
					1888.128	95 0.00000351													
					1888.102	63 0.00000367													
					1888.076	32 0.00000395													
					1888.05	4.14E-06													
					1888.023	68 0.00000390													
					1887.997	37 0.00000393													
					1887.971	05 0.00000404													
					1887.944	74 0.00000408													
					1887.918	42 0.00000419													
					1887.892	11 0.00000398													
					1887.865	79 0.00000396													
					1887.839	47 0.00000388													
					1887.813	16 0.00000409													
					1887.786	84 0.00000388													
					1887.76	53 0.00000407													
					1887.734	21 0.00000423													
					1887.707	89 0.00000411													
					1887.681	58 0.00000414													
					1887.655	26 0.00000434													
					1887.628	95 0.00000503													
					1887.602	63 0.00000533													
					1887.576	32 0.00000456													
					1887.55	4.35E-06													
					1887.529	3.73E-06													
					1887.508	3.59E-06													
					1887.488	3.83E-06													
					1887.467	4.33E-06													
					1887.446	3.81E-06													
					1887.425	4.08E-06													
					1887.404	4.53E-06													
					1887.383	4.96E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1887.363	5.63E-06													
					1887.342	4.9E-06													
					1887.321	5.01E-06													
					1887.3	4.92E-06													
					1887.279	5.17E-06													
					1887.258	5.14E-06													
					1887.238	4.47E-06													
					1887.217	4.47E-06													
					1887.196	4.48E-06													
					1887.175	4.49E-06													
					1887.154	4.34E-06													
					1887.133	4.31E-06													
					1887.113	4.11E-06													
					1887.092	3.97E-06													
					1887.071	3.66E-06													
					1887.05	3.61E-06													
					1887.029	3.62E-06													
					1887.008	3.55E-06													
					1886.988	3.53E-06													
					1886.967	3.7E-06													
					1886.946	3.96E-06													
					1886.925	4.04E-06													
					1886.904	4.25E-06													
					1886.883	3.88E-06													
					1886.863	3.89E-06													
					1886.842	3.8E-06													
					1886.821	3.82E-06													
					1886.8	3.84E-06													
					1886.779	3.85E-06													
					1886.758	3.88E-06													
					1886.738	3.95E-06													
					1886.717	4.02E-06													
					1886.696	4.05E-06													
					1886.675	4.05E-06													
					1886.654	3.91E-06													
					1886.633	3.94E-06													
					1886.613	3.89E-06													
					1886.592	3.84E-06													
					1886.571	3.77E-06													
					1886.55	3.93E-06													
					1886.521	3.67E-06													
					1886.491	3.24E-06													
					1886.462	3.11E-06													
					1886.432	3.5E-06													
					1886.403	3.7E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1886.374	3.64E-06													
					1886.344	3.56E-06													
					1886.315	3.59E-06													
					1886.285	3.69E-06													
					1886.256	3.65E-06													
					1886.226	3.7E-06													
					1886.197	3.66E-06													
					1886.168	3.86E-06													
					1886.138	3.92E-06													
					1886.109	3.89E-06													
					1886.079	4.11E-06													
					1886.05	3.91E-06													
					1886.021	3.78E-06													
					1885.991	3.76E-06													
					1885.962	3.8E-06													
					1885.932	3.86E-06													
					1885.903	3.79E-06													
					1885.874	3.6E-06													
					1885.844	3.64E-06													
					1885.815	3.61E-06													
					1885.785	3.78E-06													
					1885.756	4.1E-06													
					1885.726	4.1E-06													
					1885.697	4.11E-06													
					1885.668	4.32E-06													
					1885.638	4.11E-06													
					1885.609	4.22E-06													
					1885.579	4.09E-06													
					1885.55	4.07E-06													
					1885.521	4.02E-06													
					1885.493	3.93E-06													
					1885.464	3.9E-06													
					1885.436	4.24E-06													
					1885.407	4.43E-06													
					1885.379	4.49E-06													
					1885.35	4.37E-06													
					1885.321	4.14E-06													
					1885.293	4.38E-06													
					1885.264	4.5E-06													
					1885.236	4.54E-06													
					1885.207	4.39E-06													
					1885.179	4.6E-06													
					1885.15	4.62E-06													
					1885.121	4.59E-06													
					1885.093	4.9E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1885.064	4.24E-06													
					1885.036	3.72E-06													
					1885.007	3.52E-06													
					1884.979	3.6E-06													
					1884.95	4.09E-06													
					1884.921	4.06E-06													
					1884.893	4.04E-06													
					1884.864	3.82E-06													
					1884.836	3.82E-06													
					1884.807	3.71E-06													
					1884.779	3.72E-06													
					1884.75	3.71E-06													
					1884.721	3.51E-06													
					1884.693	3.03E-06													
					1884.664	3.74E-06													
					1884.636	4.07E-06													
					1884.607	3.97E-06													
					1884.579	4.07E-06													
					1884.55	4.41E-06													
					1884.526	4.42E-06													
					1884.502	4.41E-06													
					1884.479	4.47E-06													
					1884.455	4.66E-06													
					1884.431	4.8E-06													
					1884.407	4.85E-06													
					1884.383	4.78E-06													
					1884.36	4.64E-06													
					1884.336	4.48E-06													
					1884.312	4.55E-06													
					1884.288	4.65E-06													
					1884.264	5.34E-06													
					1884.24	5.16E-06													
					1884.217	5.03E-06													
					1884.193	4.34E-06													
					1884.169	3.91E-06													
					1884.145	3.66E-06													
					1884.121	3.88E-06													
					1884.098	3.72E-06													
					1884.074	3.93E-06													
					1884.05	4.16E-06													
					1884.026	3.97E-06													
					1884.002	3.78E-06													
					1883.979	3.87E-06													
					1883.955	3.95E-06													
					1883.931	3.83E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1883.907	3.77E-06													
					1883.883	3.75E-06													
					1883.86	3.74E-06													
					1883.836	3.69E-06													
					1883.812	3.84E-06													
					1883.788	3.98E-06													
					1883.764	3.73E-06													
					1883.74	3.69E-06													
					1883.717	3.5E-06													
					1883.693	3.61E-06													
					1883.669	3.64E-06													
					1883.645	3.85E-06													
					1883.621	3.8E-06													
					1883.598	3.97E-06													
					1883.574	3.93E-06													
					1883.55	3.94E-06													
					1883.527	4.39E-06													
					1883.503	4.35E-06													
					1883.48	4.36E-06													
					1883.457	4.2E-06													
					1883.434	4.35E-06													
					1883.41	4.43E-06													
					1883.387	4.26E-06													
					1883.364	3.97E-06													
					1883.341	3.84E-06													
					1883.317	4.42E-06													
					1883.294	4.58E-06													
					1883.271	5.05E-06													
					1883.248	5.43E-06													
					1883.224	4.71E-06													
					1883.201	4.28E-06													
					1883.178	3.93E-06													
					1883.155	3.67E-06													
					1883.131	3.59E-06													
					1883.108	3.84E-06													
					1883.085	3.84E-06													
					1883.062	4.14E-06													
					1883.038	4.05E-06													
					1883.015	3.86E-06													
					1882.992	3.93E-06													
					1882.969	4.1E-06													
					1882.945	4.15E-06													
					1882.922	4.25E-06													
					1882.899	4.37E-06													
					1882.876	4.31E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1882.852	4.23E-06													
					1882.829	4.22E-06													
					1882.806	4.3E-06													
					1882.783	4.45E-06													
					1882.759	4.45E-06													
					1882.736	4.33E-06													
					1882.713	4.44E-06													
					1882.69	4.32E-06													
					1882.666	4.39E-06													
					1882.643	4.25E-06													
					1882.62	4.25E-06													
					1882.597	4.13E-06													
					1882.573	4.26E-06													
					1882.55	4.52E-06													
					1882.524	4.69E-06													
					1882.499	5.14E-06													
					1882.473	5.05E-06													
					1882.447	5.11E-06													
					1882.422	5.04E-06													
					1882.396	5.4E-06													
					1882.371	6.19E-06													
					1882.345	6.26E-06													
					1882.319	7.44E-06													
					1882.294	9.18E-06													
					1882.268	9.21E-06													
					1882.242	7.02E-06													
					1882.217	5.56E-06													
					1882.191	4.66E-06													
					1882.165	4.11E-06													
					1882.14	3.91E-06													
					1882.114	3.67E-06													
					1882.088	3.73E-06													
					1882.063	3.67E-06													
					1882.037	3.73E-06													
					1882.012	3.62E-06													
					1881.986	3.71E-06													
					1881.96	3.73E-06													
					1881.935	3.88E-06													
					1881.909	4.21E-06													
					1881.883	4.13E-06													
					1881.858	3.94E-06													
					1881.832	3.87E-06													
					1881.806	3.63E-06													
					1881.781	3.76E-06													
					1881.755	3.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1881.729	3.87E-06													
					1881.704	4.1E-06													
					1881.678	4.04E-06													
					1881.653	4.13E-06													
					1881.627	4.01E-06													
					1881.601	4.15E-06													
					1881.576	4.23E-06													
					1881.55	4.48E-06													
					1881.524	4.58E-06													
					1881.499	4.64E-06													
					1881.473	4.86E-06													
					1881.447	4.83E-06													
					1881.422	5.33E-06													
					1881.396	5.9E-06													
					1881.371	5.89E-06													
					1881.345	5.64E-06													
					1881.319	5.36E-06													
					1881.294	4.34E-06													
					1881.268	4.14E-06													
					1881.242	3.77E-06													
					1881.217	3.89E-06													
					1881.191	3.52E-06													
					1881.165	3.64E-06													
					1881.14	3.45E-06													
					1881.114	3.46E-06													
					1881.088	3.64E-06													
					1881.063	3.66E-06													
					1881.037	3.98E-06													
					1881.012	3.92E-06													
					1880.986	4.01E-06													
					1880.96	4.05E-06													
					1880.935	3.83E-06													
					1880.909	3.72E-06													
					1880.883	3.6E-06													
					1880.858	3.33E-06													
					1880.832	3.26E-06													
					1880.806	3.17E-06													
					1880.781	3.13E-06													
					1880.755	3.65E-06													
					1880.729	3.56E-06													
					1880.704	3.51E-06													
					1880.678	3.92E-06													
					1880.653	3.88E-06													
					1880.627	4.22E-06													
					1880.601	4.15E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1880.576	4.5E-06													
					1880.55	4.49E-06													
					1880.526	4.64E-06													
					1880.501	4.79E-06													
					1880.477	4.59E-06													
					1880.452	4.98E-06													
					1880.428	4.63E-06													
					1880.404	4.55E-06													
					1880.379	4.31E-06													
					1880.355	4.03E-06													
					1880.33	4.16E-06													
					1880.306	3.96E-06													
					1880.282	4.26E-06													
					1880.257	4.53E-06													
					1880.233	0.000005													
					1880.209	6.69E-06													
					1880.184	5.4E-06													
					1880.16	5.14E-06													
					1880.135	4.74E-06													
					1880.111	4.08E-06													
					1880.087	3.89E-06													
					1880.062	0.000004													
					1880.038	4.11E-06													
					1880.013	3.99E-06													
					1879.989	4.01E-06													
					1879.965	3.85E-06													
					1879.94	3.95E-06													
					1879.916	3.95E-06													
					1879.891	4.13E-06													
					1879.867	4.15E-06													
					1879.843	4.25E-06													
					1879.818	4.26E-06													
					1879.794	4.18E-06													
					1879.77	4.06E-06													
					1879.745	3.94E-06													
					1879.721	4.03E-06													
					1879.696	4.38E-06													
					1879.672	4.34E-06													
					1879.648	4.31E-06													
					1879.623	4.27E-06													
					1879.599	3.93E-06													
					1879.574	4.55E-06													
					1879.55	4.5E-06													
					1879.523	4.53E-06													
					1879.496	4.35E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1879.469	4.29E-06													
					1879.442	4.61E-06													
					1879.415	5.77E-06													
					1879.388	5.71E-06													
					1879.361	4.74E-06													
					1879.334	4.05E-06													
					1879.307	4.12E-06													
					1879.28	4.18E-06													
					1879.253	3.93E-06													
					1879.226	4.12E-06													
					1879.199	3.93E-06													
					1879.172	3.97E-06													
					1879.145	4.01E-06													
					1879.118	3.83E-06													
					1879.091	3.72E-06													
					1879.064	3.65E-06													
					1879.036	3.62E-06													
					1879.009	3.75E-06													
					1878.982	3.71E-06													
					1878.955	3.69E-06													
					1878.928	3.43E-06													
					1878.901	3.71E-06													
					1878.874	3.73E-06													
					1878.847	3.88E-06													
					1878.82	4.13E-06													
					1878.793	3.84E-06													
					1878.766	3.69E-06													
					1878.739	3.64E-06													
					1878.712	3.17E-06													
					1878.685	3.44E-06													
					1878.658	3.57E-06													
					1878.631	3.66E-06													
					1878.604	3.78E-06													
					1878.577	3.79E-06													
					1878.55	3.98E-06													
					1878.531	3.8E-06													
					1878.513	3.56E-06													
					1878.494	3.93E-06													
					1878.47	4.41E-06													
					1878.45	4.34E-06													
					1878.429	7 0.00000450													
					1878.409	3 0.00000496													
					1878.389	5.21E-06													
					1878.368	6 0.00000533													
					1878.348	3 0.00000551													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1878.328	6.21E-06													
					1878.307	6 0.00000632													
					1878.287	3 0.00000614													
					1878.266	9 0.00000562													
					1878.246	6 0.00000570													
					1878.226	3 0.00000473													
					1878.205	9 0.00000421													
					1878.185	6 0.00000398													
					1878.165	2 0.00000392													
					1878.144	9 0.00000380													
					1878.124	5 0.00000352													
					1878.104	2 0.00000363													
					1878.083	9 0.00000372													
					1878.063	5 0.00000382													
					1878.043	2 0.00000413													
					1878.022	8 0.00000398													
					1878.002	5 0.00000396													
					1877.982	2 0.00000413													
					1877.961	8 0.00000396													
					1877.941	5 0.00000412													
					1877.921	1 0.00000398													
					1877.9	8 0.00000410													
					1877.88	5 0.00000404													
					1877.86	1 0.00000419													
					1877.839	8 0.00000434													
					1877.819	4 0.00000420													
					1877.799	1 0.00000387													
					1877.778	8 0.00000402													
					1877.758	4 0.00000418													
					1877.738	1 0.00000420													
					1877.717	7 0.00000455													
					1877.697	4 0.00000480													
					1877.677	4.42E-06													
					1877.656	7 0.00000407													
					1877.636	4 0.00000416													
					1877.616	4.12E-06													
					1877.595	7 0.00000418													
					1877.575	3 0.00000429													
					1877.555	4.43E-06													
					1877.534	2 0.00000418													
					1877.513	3 0.00000424													
					1877.492	5 0.00000461													
					1877.471	7 0.00000433													
					1877.45	8 0.00000465													
					1877.43	4.54E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1877.409	2 0.00000467													
					1877.388	3 0.00000468													
					1877.367	5 0.00000513													
					1877.346	7 0.00000499													
					1877.325	8 0.00000520													
					1877.305	4.6E-06													
					1877.284	2 0.00000480													
					1877.263	3 0.00000489													
					1877.242	5 0.00000472													
					1877.221	7 0.00000468													
					1877.2	8 0.00000451													
					1877.18	4.4E-06													
					1877.159	2 0.00000397													
					1877.138	3 0.00000435													
					1877.117	5 0.00000446													
					1877.096	7 0.00000401													
					1877.075	8 0.00000422													
					1877.055	4.3E-06													
					1877.034	2 0.00000461													
					1877.013	3 0.00000450													
					1876.992	5 0.00000424													
					1876.971	7 0.00000430													
					1876.95	8 0.00000434													
					1876.93	4.3E-06													
					1876.909	2 0.00000404													
					1876.888	3 0.00000410													
					1876.867	5 0.00000424													
					1876.846	7 0.00000425													
					1876.825	8 0.00000400													
					1876.805	3.84E-06													
					1876.784	2 0.00000405													
					1876.763	3 0.00000442													
					1876.742	5 0.00000364													
					1876.721	7 0.00000374													
					1876.7	8 0.00000402													
					1876.68	4.11E-06													
					1876.659	2 0.00000457													
					1876.638	3 0.00000470													
					1876.617	5 0.00000446													
					1876.596	7 0.00000455													
					1876.575	8 0.00000435													
					1876.555	4.27E-06													
					1876.533	7 0.00000406													
					1876.512	4 0.00000399													
					1876.491	2 0.00000432													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1876.469	9 0.00000461													
					1876.448	6 0.00000471													
					1876.427	3 0.00000415													
					1876.406	1 0.00000427													
					1876.384	8 0.00000466													
					1876.363	5 0.00000443													
					1876.342	2 0.00000461													
					1876.321	4.86E-06													
					1876.299	7 0.00000487													
					1876.278	4 0.00000561													
					1876.257	1 0.00000608													
					1876.235	9 0.00000588													
					1876.214	6 0.00000572													
					1876.193	3 0.00000495													
					1876.172	4.54E-06													
					1876.15	7 0.00000437													
					1876.129	5 0.00000465													
					1876.108	2 0.00000461													
					1876.086	9 0.00000465													
					1876.065	6 0.00000436													
					1876.044	4 0.00000430													
					1876.023	1 0.00000435													
					1876.001	8 0.00000470													
					1875.98	5 0.00000474													
					1875.959	3 0.00000434													
					1875.938	4.64E-06													
					1875.916	7 0.00000440													
					1875.895	4 0.00000427													
					1875.874	1 0.00000427													
					1875.852	9 0.00000423													
					1875.831	6 0.00000391													
					1875.81	3 0.00000377													
					1875.789	3.84E-06													
					1875.767	8 0.00000367													
					1875.746	5 0.00000353													
					1875.725	2 0.00000333													
					1875.703	9 0.00000437													
					1875.682	7 0.00000409													
					1875.661	4 0.00000463													
					1875.64	1 0.00000468													
					1875.618	8 0.00000441													
					1875.597	6 0.00000433													
					1875.576	3 0.00000469													
					1875.555	4.22E-06													
					1875.533	3 0.00000443													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1875.511	5	0.00000499												
					1875.489	8	0.00000488												
					1875.468		5.57E-06												
					1875.446	3	0.00000584												
					1875.424	6	0.00000645												
					1875.402	8	0.00000636												
					1875.381	1	0.00000622												
					1875.359	3	0.00000632												
					1875.337	6	0.00000654												
					1875.315	9	0.00000710												
					1875.294	1	0.00000683												
					1875.272	4	0.00000753												
					1875.25	7	0.00000805												
					1875.228	9	0.00000745												
					1875.207	2	0.00000644												
					1875.185	4	0.00000560												
					1875.163	7	0.00000746												
					1875.142		6.6E-06												
					1875.12	2	0.00000514												
					1875.098	5	0.00000460												
					1875.076	7	0.00000435												
					1875.055		4.3E-06												
					1875.033	3	0.00000435												
					1875.011	5	0.00000433												
					1874.989	8	0.00000437												
					1874.968		4.34E-06												
					1874.946	3	0.00000413												
					1874.924	6	0.00000432												
					1874.902	8	0.00000428												
					1874.881	1	0.00000424												
					1874.859	3	0.00000408												
					1874.837	6	0.00000405												
					1874.815	9	0.00000407												
					1874.794	1	0.00000389												
					1874.772	4	0.00000399												
					1874.75	7	0.00000446												
					1874.728	9	0.00000381												
					1874.707	2	0.00000389												
					1874.685	4	0.00000409												
					1874.663	7	0.00000394												
					1874.642		3.86E-06												
					1874.62	2	0.00000398												
					1874.598	5	0.00000435												
					1874.576	7	0.00000431												
					1874.555		4.4E-06												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1874.533	7 0.00000455													
					1874.512	4 0.00000438													
					1874.491	2 0.00000437													
					1874.469	9 0.00000424													
					1874.448	6 0.00000426													
					1874.427	3 0.00000436													
					1874.406	1 0.00000429													
					1874.384	8 0.00000416													
					1874.363	5 0.00000435													
					1874.342	2 0.00000473													
					1874.321	4.51E-06													
					1874.299	7 0.00000451													
					1874.278	4 0.00000461													
					1874.257	1 0.00000431													
					1874.235	9 0.00000447													
					1874.214	6 0.00000452													
					1874.193	3 0.00000516													
					1874.172	5.33E-06													
					1874.15	7 0.00000511													
					1874.129	5 0.00000503													
					1874.108	2 0.00000493													
					1874.086	9 0.00000432													
					1874.065	6 0.00000417													
					1874.044	4 0.00000416													
					1874.023	1 0.00000414													
					1874.001	8 0.00000391													
					1873.98	5 0.00000380													
					1873.959	3 0.00000385													
					1873.938	3.99E-06													
					1873.916	7 0.00000408													
					1873.895	4 0.00000413													
					1873.874	1 0.00000382													
					1873.852	9 0.00000395													
					1873.831	6 0.00000380													
					1873.81	3 0.00000372													
					1873.789	4.01E-06													
					1873.767	8 0.00000422													
					1873.746	5 0.00000402													
					1873.725	2 0.00000411													
					1873.703	9 0.00000411													
					1873.682	7 0.00000401													
					1873.661	4 0.00000418													
					1873.64	1 0.00000419													
					1873.618	8 0.00000422													
					1873.597	6 0.00000417													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1873.576	3	0.00000405												
					1873.555	4.06E-06													
					1873.528	7	0.00000426												
					1873.502	4	0.00000415												
					1873.476	1	0.00000418												
					1873.449	7	0.00000453												
					1873.423	4	0.00000415												
					1873.397	1	0.00000394												
					1873.37	8	0.00000410												
					1873.344	5	0.00000386												
					1873.318	2	0.00000420												
					1873.291	8	0.00000448												
					1873.265	5	0.00000500												
					1873.239	2	0.00000563												
					1873.212	9	0.00000581												
					1873.186	6	0.00000591												
					1873.16	3	0.00000581												
					1873.133	9	0.00000610												
					1873.107	6	0.00000530												
					1873.081	3	0.00000557												
					1873.055	7.05E-06													
					1873.028	7	0.00000670												
					1873.002	4	0.00000581												
					1872.976	1	0.00000379												
					1872.949	7	0.00000387												
					1872.923	4	0.00000422												
					1872.897	1	0.00000359												
					1872.87	8	0.00000355												
					1872.844	5	0.00000361												
					1872.818	2	0.00000366												
					1872.791	8	0.00000363												
					1872.765	5	0.00000353												
					1872.739	2	0.00000359												
					1872.712	9	0.00000352												
					1872.686	6	0.00000367												
					1872.66	3	0.00000380												
					1872.633	9	0.00000378												
					1872.607	6	0.00000379												
					1872.581	3	0.00000364												
					1872.555	3.47E-06													
					1872.533	3	0.00000347												
					1872.511	5	0.00000370												
					1872.489	8	0.00000432												
					1872.468	0.000004													
					1872.446	3	0.00000403												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1872.424	6	0.00000403												
					1872.402	8	0.00000394												
					1872.381	1	0.00000396												
					1872.359	3	0.00000436												
					1872.337	6	0.00000500												
					1872.315	9	0.00000474												
					1872.294	1	0.00000356												
					1872.272	4	0.00000339												
					1872.25	7	0.00000365												
					1872.228	9	0.00000363												
					1872.207	2	0.00000396												
					1872.185	4	0.00000378												
					1872.163	7	0.00000365												
					1872.142		3.83E-06												
					1872.12	2	0.00000358												
					1872.098	5	0.00000377												
					1872.076	7	0.00000384												
					1872.055		3.48E-06												
					1872.033	3	0.00000345												
					1872.011	5	0.00000366												
					1871.989	8	0.00000371												
					1871.968		3.53E-06												
					1871.946	3	0.00000379												
					1871.924	6	0.00000353												
					1871.902	8	0.00000361												
					1871.881	1	0.00000360												
					1871.859	3	0.00000354												
					1871.837	6	0.00000356												
					1871.815	9	0.00000354												
					1871.794	1	0.00000375												
					1871.772	4	0.00000375												
					1871.75	7	0.00000374												
					1871.728	9	0.00000362												
					1871.707	2	0.00000380												
					1871.685	4	0.00000376												
					1871.663	7	0.00000394												
					1871.642		4.19E-06												
					1871.62	2	0.00000441												
					1871.598	5	0.00000434												
					1871.576	7	0.00000459												
					1871.555		4.4E-06												
					1871.535	8	0.00000423												
					1871.516	5	0.00000458												
					1871.497	3	0.00000450												
					1871.478	1	0.00000482												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1871.458	8 0.00000451													
					1871.439	6 0.00000434													
					1871.42	4 0.00000420													
					1871.401	2 0.00000341													
					1871.381	9 0.00000317													
					1871.362	7 0.00000334													
					1871.343	5 0.00000373													
					1871.324	2 0.00000408													
					1871.305	3.86E-06													
					1871.285	8 0.00000395													
					1871.266	5 0.00000399													
					1871.247	3 0.00000386													
					1871.228	1 0.00000373													
					1871.208	8 0.00000372													
					1871.189	6 0.00000371													
					1871.17	4 0.00000383													
					1871.151	2 0.00000373													
					1871.131	9 0.00000357													
					1871.112	7 0.00000378													
					1871.093	5 0.00000401													
					1871.074	2 0.00000401													
					1871.055	3.79E-06													
					1871.035	8 0.00000397													
					1871.016	5 0.00000376													
					1870.997	3 0.00000376													
					1870.978	1 0.00000355													
					1870.958	8 0.00000380													
					1870.939	6 0.00000379													
					1870.92	4 0.00000409													
					1870.901	2 0.00000400													
					1870.881	9 0.00000397													
					1870.862	7 0.00000407													
					1870.843	5 0.00000400													
					1870.824	2 0.00000419													
					1870.805	4.18E-06													
					1870.785	8 0.00000414													
					1870.766	5 0.00000428													
					1870.747	3 0.00000389													
					1870.728	1 0.00000397													
					1870.708	8 0.00000424													
					1870.689	6 0.00000420													
					1870.67	4 0.00000443													
					1870.651	2 0.00000454													
					1870.631	9 0.00000485													
					1870.612	7 0.00000487													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1870.593	5 0.00000501													
					1870.574	2 0.00000477													
					1870.555	4.45E-06													
					1870.526	4 0.00000472													
					1870.497	9 0.00000518													
					1870.469	3 0.00000523													
					1870.44	7 0.00000533													
					1870.412	1 0.00000498													
					1870.383	6 0.00000489													
					1870.355	5.17E-06													
					1870.326	4 0.00000530													
					1870.297	9 0.00000546													
					1870.269	3 0.00000632													
					1870.24	7 0.00000714													
					1870.212	1 0.00000738													
					1870.183	6 0.00000746													
					1870.155	8.39E-06													
					1870.126	4 0.00000832													
					1870.097	9 0.00000787													
					1870.069	3 0.00000785													
					1870.04	7 0.00000613													
					1870.012	1 0.00000471													
					1869.983	6 0.00000434													
					1869.955	3.98E-06													
					1869.926	4 0.00000372													
					1869.897	9 0.00000362													
					1869.869	3 0.00000394													
					1869.84	7 0.00000382													
					1869.812	1 0.00000374													
					1869.783	6 0.00000347													
					1869.755	3.38E-06													
					1869.726	4 0.00000322													
					1869.697	9 0.00000333													
					1869.669	3 0.00000354													
					1869.64	7 0.00000331													
					1869.612	1 0.00000347													
					1869.583	6 0.00000358													
					1869.555	3.68E-06													
					1869.535	4 0.00000431													
					1869.515	8 0.00000419													
					1869.496	2 0.00000416													
					1869.476	6 0.00000407													
					1869.457	3.99E-06													
					1869.437	4 0.00000379													
					1869.417	7 0.00000429													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1869.398	1 0.00000392													
					1869.378	5 0.00000381													
					1869.358	9 0.00000359													
					1869.339	3 0.00000370													
					1869.319	7 0.00000358													
					1869.3	1 0.00000358													
					1869.28	5 0.00000386													
					1869.26	9 0.00000394													
					1869.241	3 0.00000407													
					1869.221	7 0.00000416													
					1869.202	1 0.00000376													
					1869.182	5 0.00000374													
					1869.162	8 0.00000370													
					1869.143	2 0.00000354													
					1869.123	6 0.00000330													
					1869.104	3.32E-06													
					1869.084	4 0.00000334													
					1869.064	8 0.00000308													
					1869.045	2 0.00000318													
					1869.025	6 0.00000334													
					1869.006	3.53E-06													
					1868.986	4 0.00000391													
					1868.966	8 0.00000356													
					1868.947	2 0.00000367													
					1868.927	5 0.00000383													
					1868.907	9 0.00000364													
					1868.888	3 0.00000347													
					1868.868	7 0.00000346													
					1868.849	1 0.00000339													
					1868.829	5 0.00000358													
					1868.809	9 0.00000347													
					1868.79	3 0.00000380													
					1868.77	7 0.00000400													
					1868.751	1 0.00000360													
					1868.731	5 0.00000348													
					1868.711	9 0.00000381													
					1868.692	3 0.00000386													
					1868.672	6 0.00000363													
					1868.653	3.64E-06													
					1868.633	4 0.00000396													
					1868.613	8 0.00000377													
					1868.594	2 0.00000402													
					1868.574	6 0.00000408													
					1868.555	3.81E-06													
					1868.53	4.07E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1868.505	3.94E-06													
					1868.48	4.04E-06													
					1868.455	3.55E-06													
					1868.43	3.66E-06													
					1868.405	4.04E-06													
					1868.38	3.88E-06													
					1868.355	3.94E-06													
					1868.33	3.87E-06													
					1868.305	3.96E-06													
					1868.28	4.06E-06													
					1868.255	3.78E-06													
					1868.23	3.66E-06													
					1868.205	3.6E-06													
					1868.18	3.63E-06													
					1868.155	3.48E-06													
					1868.13	3.46E-06													
					1868.105	3.43E-06													
					1868.08	3.92E-06													
					1868.055	3.97E-06													
					1868.03	3.68E-06													
					1868.005	3.68E-06													
					1867.98	3.48E-06													
					1867.955	3.55E-06													
					1867.93	3.66E-06													
					1867.905	3.78E-06													
					1867.88	3.52E-06													
					1867.855	3.49E-06													
					1867.83	3.44E-06													
					1867.805	3.5E-06													
					1867.78	3.56E-06													
					1867.755	3.5E-06													
					1867.73	3.78E-06													
					1867.705	3.99E-06													
					1867.68	3.78E-06													
					1867.655	3.85E-06													
					1867.63	3.72E-06													
					1867.605	3.79E-06													
					1867.58	3.71E-06													
					1867.555	3.75E-06													
					1867.53	4.05E-06													
					1867.505	4.8E-06													
					1867.48	4.07E-06													
					1867.455	4.01E-06													
					1867.43	4.25E-06													
					1867.405	4.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1867.38	0.000004													
					1867.355	4.37E-06													
					1867.33	4.19E-06													
					1867.305	4.38E-06													
					1867.28	4.64E-06													
					1867.255	4.52E-06													
					1867.23	4.38E-06													
					1867.205	4.25E-06													
					1867.18	4.23E-06													
					1867.155	3.74E-06													
					1867.13	3.63E-06													
					1867.105	3.36E-06													
					1867.08	3.63E-06													
					1867.055	3.56E-06													
					1867.03	3.72E-06													
					1867.005	3.67E-06													
					1866.98	3.51E-06													
					1866.955	3.43E-06													
					1866.93	3.35E-06													
					1866.905	3.39E-06													
					1866.88	3.37E-06													
					1866.855	3.55E-06													
					1866.83	3.7E-06													
					1866.805	3.75E-06													
					1866.78	3.67E-06													
					1866.755	3.52E-06													
					1866.73	3.56E-06													
					1866.705	3.51E-06													
					1866.68	3.63E-06													
					1866.655	3.52E-06													
					1866.63	3.83E-06													
					1866.605	3.89E-06													
					1866.58	4.26E-06													
					1866.555	4.07E-06													
					1866.536	0.00000378													
					1866.502	0.00000367													
					1866.478	0.00000404													
					1866.454	0.00000401													
					1866.433	4.22E-06													
					1866.407	0.00000401													
					1866.383	0.00000386													
					1866.359	0.00000362													
					1866.335	0.00000359													
					1866.311	0.00000381													
					1866.286	0.00000386													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1866.262	3	0.00000381												
					1866.237	9	0.00000390												
					1866.213	5	0.00000352												
					1866.189	1	0.00000369												
					1866.164	8	0.00000375												
					1866.14	4	0.00000386												
					1866.116		3.69E-06												
					1866.091	6	0.00000393												
					1866.067	2	0.00000382												
					1866.042	8	0.00000406												
					1866.018	4	0.00000388												
					1865.994		3.66E-06												
					1865.969	6	0.00000358												
					1865.945	2	0.00000364												
					1865.92	9	0.00000348												
					1865.896	5	0.00000360												
					1865.872	1	0.00000345												
					1865.847	7	0.00000363												
					1865.823	3	0.00000366												
					1865.798	9	0.00000355												
					1865.774	5	0.00000340												
					1865.75	1	0.00000343												
					1865.725	7	0.00000341												
					1865.701	3	0.00000351												
					1865.677		3.78E-06												
					1865.652	6	0.00000346												
					1865.628	2	0.00000351												
					1865.603	8	0.00000353												
					1865.579	4	0.00000326												
					1865.555		3.3E-06												
					1865.533	3	0.00000379												
					1865.511	5	0.00000370												
					1865.489	8	0.00000358												
					1865.468		3.47E-06												
					1865.446	3	0.00000342												
					1865.424	6	0.00000351												
					1865.402	8	0.00000347												
					1865.381	1	0.00000382												
					1865.359	3	0.00000351												
					1865.337	6	0.00000383												
					1865.315	9	0.00000356												
					1865.294	1	0.00000316												
					1865.272	4	0.00000327												
					1865.25	7	0.00000345												
					1865.228	9	0.00000354												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year	Linsley, 2000a A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1865.207	2	0.00000352													
					1865.185	4	0.00000357													
					1865.163	7	0.00000380													
					1865.142		3.86E-06													
					1865.12	2	0.00000363													
					1865.098	5	0.00000379													
					1865.076	7	0.00000363													
					1865.055		3.65E-06													
					1865.033	3	0.00000381													
					1865.011	5	0.00000373													
					1864.989	8	0.00000366													
					1864.968		3.8E-06													
					1864.946	3	0.00000399													
					1864.924	6	0.00000394													
					1864.902	8	0.00000416													
					1864.881	1	0.00000402													
					1864.859	3	0.00000395													
					1864.837	6	0.00000389													
					1864.815	9	0.00000379													
					1864.794	1	0.00000358													
					1864.772	4	0.00000360													
					1864.75	7	0.00000387													
					1864.728	9	0.00000403													
					1864.707	2	0.00000436													
					1864.685	4	0.00000406													
					1864.663	7	0.00000387													
					1864.642		3.89E-06													
					1864.62	2	0.00000381													
					1864.598	5	0.00000380													
					1864.576	7	0.00000358													
					1864.555		3.52E-06													
					1864.53	6	0.00000329													
					1864.506	2	0.00000295													
					1864.481	8	0.00000310													
					1864.457	4	0.00000365													
					1864.433		4.58E-06													
					1864.408	7	0.00000513													
					1864.384	3	0.00000464													
					1864.359	9	0.00000487													
					1864.335	5	0.00000499													
					1864.311	1	0.00000481													
					1864.286	7	0.00000466													
					1864.262	3	0.00000477													
					1864.237	9	0.00000462													
					1864.213	5	0.00000456													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a				Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1864.189	1 0.00000488													
					1864.164	8 0.00000427													
					1864.14	4 0.00000398													
					1864.116	3.94E-06													
					1864.091	6 0.00000389													
					1864.067	2 0.00000395													
					1864.042	8 0.00000394													
					1864.018	4 0.00000381													
					1863.994	3.86E-06													
					1863.969	6 0.00000375													
					1863.945	2 0.00000374													
					1863.92	9 0.00000371													
					1863.896	5 0.00000372													
					1863.872	1 0.00000395													
					1863.847	7 0.00000390													
					1863.823	3 0.00000371													
					1863.798	9 0.00000330													
					1863.774	5 0.00000344													
					1863.75	1 0.00000343													
					1863.725	7 0.00000355													
					1863.701	3 0.00000344													
					1863.677	3.52E-06													
					1863.652	6 0.00000356													
					1863.628	2 0.00000382													
					1863.603	8 0.00000376													
					1863.579	4 0.00000416													
					1863.555	0.000004													
					1863.53	3.96E-06													
					1863.505	3.79E-06													
					1863.48	3.95E-06													
					1863.455	3.8E-06													
					1863.43	3.9E-06													
					1863.405	4.02E-06													
					1863.38	4.18E-06													
					1863.355	4.25E-06													
					1863.33	4.14E-06													
					1863.305	4.03E-06													
					1863.28	3.86E-06													
					1863.255	3.8E-06													
					1863.23	3.57E-06													
					1863.205	3.38E-06													
					1863.18	3.28E-06													
					1863.155	3.25E-06													
					1863.13	3.4E-06													
					1863.105	3.36E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1863.08	3.39E-06													
					1863.055	3.33E-06													
					1863.03	3.28E-06													
					1863.005	3.51E-06													
					1862.98	3.36E-06													
					1862.955	3.73E-06													
					1862.93	3.49E-06													
					1862.905	3.81E-06													
					1862.88	3.6E-06													
					1862.855	3.66E-06													
					1862.83	3.64E-06													
					1862.805	3.85E-06													
					1862.78	3.61E-06													
					1862.755	3.69E-06													
					1862.73	3.84E-06													
					1862.705	4.15E-06													
					1862.68	4.11E-06													
					1862.655	3.9E-06													
					1862.63	3.92E-06													
					1862.605	3.78E-06													
					1862.58	3.61E-06													
					1862.555	3.45E-06													
					1862.526	4 0.00000368													
					1862.497	9 0.00000377													
					1862.469	3 0.00000361													
					1862.44	7 0.00000380													
					1862.412	1 0.00000369													
					1862.383	6 0.00000372													
					1862.355	3.95E-06													
					1862.326	4 0.00000382													
					1862.297	9 0.00000373													
					1862.269	3 0.00000397													
					1862.24	7 0.00000369													
					1862.212	1 0.00000359													
					1862.183	6 0.00000375													
					1862.155	3.58E-06													
					1862.126	4 0.00000368													
					1862.097	9 0.00000367													
					1862.069	3 0.00000377													
					1862.04	7 0.00000376													
					1862.012	1 0.00000365													
					1861.983	6 0.00000367													
					1861.955	3.44E-06													
					1861.926	4 0.00000372													
					1861.897	9 0.00000373													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Anthrop infl >1870 Ba/Ca (atomic)	Linsley, 2000a Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1861.869	3 0.00000383													
					1861.84	7 0.00000365													
					1861.812	1 0.00000361													
					1861.783	6 0.00000432													
					1861.755	3.61E-06													
					1861.726	4 0.00000339													
					1861.697	9 0.00000326													
					1861.669	3 0.00000334													
					1861.64	7 0.00000373													
					1861.612	1 0.00000388													
					1861.583	6 0.00000392													
					1861.555	4.53E-06													
					1861.535	4 0.00000406													
					1861.515	8 0.00000410													
					1861.496	2 0.00000413													
					1861.476	6 0.00000398													
					1861.457	4.33E-06													
					1861.437	4 0.00000422													
					1861.417	7 0.00000389													
					1861.398	1 0.00000397													
					1861.378	5 0.00000391													
					1861.358	9 0.00000400													
					1861.339	3 0.00000442													
					1861.319	7 0.00000435													
					1861.3	1 0.00000414													
					1861.28	5 0.00000436													
					1861.26	9 0.00000483													
					1861.241	3 0.00000472													
					1861.221	7 0.00000439													
					1861.202	1 0.00000420													
					1861.182	5 0.00000430													
					1861.162	8 0.00000414													
					1861.143	2 0.00000417													
					1861.123	6 0.00000406													
					1861.104	3.83E-06													
					1861.084	4 0.00000345													
					1861.064	8 0.00000350													
					1861.045	2 0.00000364													
					1861.025	6 0.00000368													
					1861.006	3.83E-06													
					1860.986	4 0.00000389													
					1860.966	8 0.00000393													
					1860.947	2 0.00000416													
					1860.927	5 0.00000401													
					1860.907	9 0.00000382													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1860.888	3	0.00000351												
					1860.868	7	0.00000359												
					1860.849	1	0.00000375												
					1860.829	5	0.00000351												
					1860.809	9	0.00000355												
					1860.79	3	0.00000389												
					1860.77	7	0.00000387												
					1860.751	1	0.00000386												
					1860.731	5	0.00000380												
					1860.711	9	0.00000366												
					1860.692	3	0.00000345												
					1860.672	6	0.00000325												
					1860.653		3.15E-06												
					1860.633	4	0.00000314												
					1860.613	8	0.00000326												
					1860.594	2	0.00000350												
					1860.574	6	0.00000394												
					1860.555		3.73E-06												
					1860.536	5	0.00000354												
					1860.518		3.75E-06												
					1860.499	4	0.00000375												
					1860.48	9	0.00000406												
					1860.462	4	0.00000431												
					1860.443	9	0.00000405												
					1860.425	4	0.00000417												
					1860.406	9	0.00000412												
					1860.388	3	0.00000450												
					1860.369	8	0.00000467												
					1860.351	3	0.00000435												
					1860.332	8	0.00000459												
					1860.314	3	0.00000485												
					1860.295	7	0.00000486												
					1860.277	2	0.00000478												
					1860.258	7	0.00000452												
					1860.24	2	0.00000441												
					1860.221	7	0.00000420												
					1860.203	1	0.00000402												
					1860.184	6	0.00000381												
					1860.166	1	0.00000387												
					1860.147	6	0.00000375												
					1860.129	1	0.00000361												
					1860.11	6	0.00000345												
					1860.092		3.67E-06												
					1860.073	5	0.00000393												
					1860.055		3.93E-06												

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	Quinn et al. 1996: GRL Age	mean 4 samples/ yr 18O	Isdale et al. 2001 Year	Anthrop infl >1870 Flouresence	McCulloch, M. et al., 2003 DATE	Ba/Ca (atomic)	Anthrop infl >1870 Year A.D.	Linsley, 2000a Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	Quinn et al. 1993 QSR Age	QSR 18O	Kuhnert et al,1999 interpolated date	interpolated d13C	interpolated d18O	Zinke et al, 2004 - Ifaty Madagascar Year	12C/13C	16O/18O	Sr/Ca
					1860.036	5 0.00000415													
					1860.018	3.96E-06													
					1859.999	4 0.00000396													
					1859.98	9 0.00000414													
					1859.962	4 0.00000416													
					1859.943	9 0.00000381													
					1859.925	4 0.00000388													
					1859.906	9 0.00000372													
					1859.888	3 0.00000387													
					1859.869	8 0.00000391													
					1859.851	3 0.00000377													
					1859.832	8 0.00000361													
					1859.814	3 0.00000358													
					1859.795	7 0.00000348													
					1859.777	2 0.00000342													
					1859.758	7 0.00000364													
					1859.74	2 0.00000385													
					1859.721	7 0.00000395													
					1859.703	1 0.00000402													
					1859.684	6 0.00000391													
					1859.666	1 0.00000399													
					1859.647	6 0.00000419													
					1859.629	1 0.00000413													
					1859.61	6 0.00000393													
					1859.592	3.73E-06													
					1859.573	5 0.00000382													
					1859.555	4.37E-06													
					1859.535	2 0.00000434													
					1859.515	4 0.00000424													
					1859.495	7 0.00000389													
					1859.475	9 0.00000422													
					1859.456	1 0.00000403													
					1859.436	3 0.00000413													
					1859.416	5 0.00000396													
					1859.396	7 0.00000388													
					1859.377	4.08E-06													
					1859.357	2 0.00000448													
					1859.337	4 0.00000439													
					1859.317	6 0.00000444													
					1859.297	8 0.00000478													
					1859.278	4.05E-06													
					1859.258	3 0.00000415													
					1859.238	5 0.00000456													
					1859.218	7 0.00000404													
					1859.198	9 0.00000446													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1859.179	1 0.00000539													
					1859.159	3 0.00000610													
					1859.139	6 0.00000543													
					1859.119	8 0.00000512													
					1859.1	5.54E-06													
					1859.078	3.33E-06													
					1859.056	3.93E-06													
					1859.034	4.05E-06													
					1859.012	3.14E-06													
					1858.99	4.05E-06													
					1858.968	3.94E-06													
					1858.946	2.95E-06													
					1858.924	3.64E-06													
					1858.902	3.63E-06													
					1858.88	3.32E-06													
					1858.858	4.07E-06													
					1858.836	3.9E-06													
					1858.814	2.8E-06													
					1858.792	2.71E-06													
					1858.77	2.76E-06													
					1858.748	3.27E-06													
					1858.726	3.44E-06													
					1858.704	3.71E-06													
					1858.682	3.3E-06													
					1858.66	3.99E-06													
					1858.638	3.31E-06													
					1858.616	3.53E-06													
					1858.594	3.79E-06													
					1858.572	3.93E-06													
					1858.55	3.72E-06													
					1858.524	3.98E-06													
					1858.497	3.56E-06													
					1858.471	3.25E-06													
					1858.445	3.38E-06													
					1858.418	3.41E-06													
					1858.392	3.57E-06													
					1858.366	3.64E-06													
					1858.339	3.61E-06													
					1858.313	3.55E-06													
					1858.287	3.65E-06													
					1858.261	3.6E-06													
					1858.234	3.58E-06													
					1858.208	3.41E-06													
					1858.182	3.56E-06													
					1858.155	3.48E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1858.129	3.52E-06													
					1858.103	3.81E-06													
					1858.076	3.76E-06													
					1858.05	3.68E-06													
					1858.024	3.6E-06													
					1857.997	3.74E-06													
					1857.971	3.81E-06													
					1857.945	3.58E-06													
					1857.918	3.42E-06													
					1857.892	3.68E-06													
					1857.866	3.3E-06													
					1857.839	3.45E-06													
					1857.813	3.5E-06													
					1857.787	3.83E-06													
					1857.761	3.73E-06													
					1857.734	3.79E-06													
					1857.708	3.84E-06													
					1857.682	3.55E-06													
					1857.655	3.81E-06													
					1857.629	3.9E-06													
					1857.603	3.31E-06													
					1857.576	3.11E-06													
					1857.55	3.32E-06													
					1857.528	3.51E-06													
					1857.507	3.74E-06													
					1857.485	4.01E-06													
					1857.463	3.93E-06													
					1857.441	3.94E-06													
					1857.42	4.05E-06													
					1857.398	4.1E-06													
					1857.376	3.95E-06													
					1857.354	3.83E-06													
					1857.333	3.87E-06													
					1857.311	3.94E-06													
					1857.289	0.000004													
					1857.267	4.09E-06													
					1857.246	4.24E-06													
					1857.224	3.96E-06													
					1857.202	3.81E-06													
					1857.18	3.78E-06													
					1857.159	3.5E-06													
					1857.137	3.41E-06													
					1857.115	3.34E-06													
					1857.093	3.22E-06													
					1857.072	3.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1857.05	3.04E-06													
					1857.028	3.78E-06													
					1857.007	2.98E-06													
					1856.985	3.23E-06													
					1856.963	3.19E-06													
					1856.941	3.08E-06													
					1856.92	3.37E-06													
					1856.898	3.56E-06													
					1856.876	3.74E-06													
					1856.854	3.72E-06													
					1856.833	3.65E-06													
					1856.811	3.76E-06													
					1856.789	3.56E-06													
					1856.767	3.37E-06													
					1856.746	3.51E-06													
					1856.724	3.61E-06													
					1856.702	3.74E-06													
					1856.68	3.57E-06													
					1856.659	3.73E-06													
					1856.637	3.8E-06													
					1856.615	3.87E-06													
					1856.593	3.58E-06													
					1856.572	3.77E-06													
					1856.55	3.65E-06													
					1856.502	3.43E-06													
					1856.455	3.4E-06													
					1856.407	3.76E-06													
					1856.36	3.47E-06													
					1856.312	3.55E-06													
					1856.264	3.54E-06													
					1856.217	3.44E-06													
					1856.169	3.08E-06													
					1856.121	3.39E-06													
					1856.074	3.54E-06													
					1856.026	3.59E-06													
					1855.979	3.75E-06													
					1855.931	3.55E-06													
					1855.883	3.75E-06													
					1855.836	3.56E-06													
					1855.788	3.44E-06													
					1855.74	3.53E-06													
					1855.693	3.47E-06													
					1855.645	3.34E-06													
					1855.598	3.72E-06													
					1855.55	4.07E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1855.518	4.04E-06													
					1855.485	4.39E-06													
					1855.453	4.66E-06													
					1855.421	4.65E-06													
					1855.389	4.23E-06													
					1855.356	3.72E-06													
					1855.324	3.69E-06													
					1855.292	3.31E-06													
					1855.26	3.47E-06													
					1855.227	3.68E-06													
					1855.195	3.29E-06													
					1855.163	3.32E-06													
					1855.131	3.32E-06													
					1855.098	3.38E-06													
					1855.066	3.44E-06													
					1855.034	3.52E-06													
					1855.002	3.44E-06													
					1854.969	3.68E-06													
					1854.937	3.86E-06													
					1854.905	3.93E-06													
					1854.873	3.91E-06													
					1854.84	3.77E-06													
					1854.808	3.68E-06													
					1854.776	3.7E-06													
					1854.744	3.43E-06													
					1854.711	3.38E-06													
					1854.679	3.5E-06													
					1854.647	3.66E-06													
					1854.615	3.81E-06													
					1854.582	3.91E-06													
					1854.55	3.82E-06													
					1854.499	3.59E-06													
					1854.473	3.71E-06													
					1854.447	0.000004													
					1854.422	4.43E-06													
					1854.396	3.86E-06													
					1854.371	3.77E-06													
					1854.345	3.85E-06													
					1854.319	3.71E-06													
					1854.294	3.97E-06													
					1854.268	4.55E-06													
					1854.242	4.11E-06													
					1854.217	4.12E-06													
					1854.191	3.97E-06													
					1854.165	4.31E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1854.14	4.07E-06													
					1854.114	3.72E-06													
					1854.088	3.73E-06													
					1854.063	3.82E-06													
					1854.037	3.4E-06													
					1854.012	3.38E-06													
					1853.986	3.01E-06													
					1853.96	3.17E-06													
					1853.935	3.1E-06													
					1853.909	3.37E-06													
					1853.883	3.43E-06													
					1853.858	3.72E-06													
					1853.832	3.22E-06													
					1853.806	3.36E-06													
					1853.781	3.13E-06													
					1853.755	3.46E-06													
					1853.729	3.43E-06													
					1853.704	3.66E-06													
					1853.678	3.54E-06													
					1853.653	3.68E-06													
					1853.627	3.47E-06													
					1853.601	3.46E-06													
					1853.576	3.64E-06													
					1853.55	3.71E-06													
					1853.535	3.6E-06													
					1853.519	3.64E-06													
					1853.504	3.45E-06													
					1853.488	3.21E-06													
					1853.473	3.59E-06													
					1853.458	3.65E-06													
					1853.442	3.63E-06													
					1853.427	3.09E-06													
					1853.412	3.14E-06													
					1853.396	3.36E-06													
					1853.381	3.74E-06													
					1853.365	3.94E-06													
					1853.35	3.28E-06													
					1853.335	3.54E-06													
					1853.319	3.19E-06													
					1853.304	3.33E-06													
					1853.288	3.15E-06													
					1853.273	3.68E-06													
					1853.258	3.85E-06													
					1853.242	3.77E-06													
					1853.227	3.25E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1853.212	3.08E-06													
					1853.196	3.41E-06													
					1853.181	3.65E-06													
					1853.165	3.31E-06													
					1853.15	3.63E-06													
					1853.135	3.6E-06													
					1853.119	3.55E-06													
					1853.104	3.49E-06													
					1853.088	3.64E-06													
					1853.073	3.56E-06													
					1853.058	3.95E-06													
					1853.042	3.17E-06													
					1853.027	3.47E-06													
					1853.012	4.02E-06													
					1852.996	3.87E-06													
					1852.981	3.86E-06													
					1852.965	3.35E-06													
					1852.95	3.41E-06													
					1852.935	3.42E-06													
					1852.919	3.36E-06													
					1852.904	3.53E-06													
					1852.888	3.21E-06													
					1852.873	3.19E-06													
					1852.858	3.15E-06													
					1852.842	3.44E-06													
					1852.827	3.55E-06													
					1852.812	3.37E-06													
					1852.796	3.55E-06													
					1852.781	3.78E-06													
					1852.765	3.07E-06													
					1852.75	3.15E-06													
					1852.735	3.44E-06													
					1852.719	3.01E-06													
					1852.704	3.34E-06													
					1852.688	3.39E-06													
					1852.673	3.13E-06													
					1852.658	3.29E-06													
					1852.642	3.24E-06													
					1852.627	3.59E-06													
					1852.612	3.65E-06													
					1852.596	3.73E-06													
					1852.581	3.37E-06													
					1852.565	3.59E-06													
					1852.55	4.05E-06													
					1852.535	3.69E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1852.521	3.37E-06													
					1852.506	3.78E-06													
					1852.491	3.88E-06													
					1852.476	3.8E-06													
					1852.462	3.91E-06													
					1852.447	3.53E-06													
					1852.432	3.62E-06													
					1852.418	3.79E-06													
					1852.403	3.78E-06													
					1852.388	3.91E-06													
					1852.374	3.26E-06													
					1852.359	3.94E-06													
					1852.344	3.17E-06													
					1852.329	3.82E-06													
					1852.315	3.52E-06													
					1852.3	3.34E-06													
					1852.285	3.25E-06													
					1852.271	2.83E-06													
					1852.256	2.94E-06													
					1852.241	3.01E-06													
					1852.226	3.68E-06													
					1852.212	3.13E-06													
					1852.197	3.12E-06													
					1852.182	3.09E-06													
					1852.168	2.87E-06													
					1852.153	3.03E-06													
					1852.138	3.12E-06													
					1852.124	3.19E-06													
					1852.109	2.88E-06													
					1852.094	2.89E-06													
					1852.079	2.99E-06													
					1852.065	3.14E-06													
					1852.05	3.31E-06													
					1852.035	3.52E-06													
					1852.021	3.49E-06													
					1852.006	3.62E-06													
					1851.991	3.38E-06													
					1851.976	3.29E-06													
					1851.962	3.59E-06													
					1851.947	3.06E-06													
					1851.932	3.74E-06													
					1851.918	3.82E-06													
					1851.903	3.43E-06													
					1851.888	3.27E-06													
					1851.874	3.15E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1851.859	3.07E-06													
					1851.844	3.21E-06													
					1851.829	3.53E-06													
					1851.815	3.39E-06													
					1851.8	3.01E-06													
					1851.785	3.21E-06													
					1851.771	3.3E-06													
					1851.756	3.37E-06													
					1851.741	3.29E-06													
					1851.726	3.49E-06													
					1851.712	3.42E-06													
					1851.697	3.49E-06													
					1851.682	3.78E-06													
					1851.668	3.74E-06													
					1851.653	3.89E-06													
					1851.638	3.86E-06													
					1851.624	3.85E-06													
					1851.609	3.78E-06													
					1851.594	3.75E-06													
					1851.579	3.76E-06													
					1851.565	3.55E-06													
					1851.55	3.82E-06													
					1851.527	4.03E-06													
					1851.505	3.78E-06													
					1851.482	3.87E-06													
					1851.459	0.000004													
					1851.436	4.03E-06													
					1851.414	3.92E-06													
					1851.391	3.39E-06													
					1851.368	3.79E-06													
					1851.345	4.06E-06													
					1851.323	4.19E-06													
					1851.3	4.18E-06													
					1851.277	3.71E-06													
					1851.255	3.47E-06													
					1851.232	3.18E-06													
					1851.209	3.32E-06													
					1851.186	3.3E-06													
					1851.164	3.09E-06													
					1851.141	2.99E-06													
					1851.118	3.15E-06													
					1851.095	3.55E-06													
					1851.073	3.62E-06													
					1851.05	3.58E-06													
					1851.027	3.43E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1851.005	3.56E-06													
					1850.982	3.37E-06													
					1850.959	3.54E-06													
					1850.936	3.69E-06													
					1850.914	3.74E-06													
					1850.891	3.36E-06													
					1850.868	3.54E-06													
					1850.845	3.48E-06													
					1850.823	3.2E-06													
					1850.8	3.21E-06													
					1850.777	3.32E-06													
					1850.755	3.74E-06													
					1850.732	3.96E-06													
					1850.709	3.62E-06													
					1850.686	3.54E-06													
					1850.664	3.38E-06													
					1850.641	3.47E-06													
					1850.618	3.5E-06													
					1850.595	3.59E-06													
					1850.573	3.56E-06													
					1850.55	3.25E-06													
					1850.535	3.45E-06													
					1850.521	3.5E-06													
					1850.506	3.68E-06													
					1850.491	3.38E-06													
					1850.476	3.08E-06													
					1850.462	3.25E-06													
					1850.447	3.28E-06													
					1850.432	3.54E-06													
					1850.418	3.58E-06													
					1850.403	3.74E-06													
					1850.388	3.8E-06													
					1850.374	3.74E-06													
					1850.359	3.53E-06													
					1850.344	3.62E-06													
					1850.329	3.66E-06													
					1850.315	3.24E-06													
					1850.3	3.3E-06													
					1850.285	3.6E-06													
					1850.271	3.7E-06													
					1850.256	3.56E-06													
					1850.241	3.48E-06													
					1850.226	3.46E-06													
					1850.212	3.32E-06													
					1850.197	3.12E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1850.182	3.41E-06													
					1850.168	3.49E-06													
					1850.153	3.96E-06													
					1850.138	4.11E-06													
					1850.124	3.78E-06													
					1850.109	3.67E-06													
					1850.094	3.56E-06													
					1850.079	3.85E-06													
					1850.065	3.5E-06													
					1850.05	3.64E-06													
					1850.035	3.64E-06													
					1850.021	3.36E-06													
					1850.006	3.51E-06													
					1849.991	3.47E-06													
					1849.976	3.47E-06													
					1849.962	3.22E-06													
					1849.947	3.22E-06													
					1849.932	3.21E-06													
					1849.918	3.26E-06													
					1849.903	3.61E-06													
					1849.888	3.61E-06													
					1849.874	3.56E-06													
					1849.859	3.51E-06													
					1849.844	3.46E-06													
					1849.829	3.44E-06													
					1849.815	3.56E-06													
					1849.8	3.65E-06													
					1849.785	3.61E-06													
					1849.771	3.64E-06													
					1849.756	3.14E-06													
					1849.741	3.06E-06													
					1849.726	3.27E-06													
					1849.712	3.39E-06													
					1849.697	3.63E-06													
					1849.682	3.56E-06													
					1849.668	3.47E-06													
					1849.653	3.46E-06													
					1849.638	3.27E-06													
					1849.624	3.27E-06													
					1849.609	3.16E-06													
					1849.594	3.14E-06													
					1849.579	3.17E-06													
					1849.565	3.1E-06													
					1849.55	2.9E-06													
					1849.531	2.86E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1849.512	2.74E-06													
					1849.492	2.87E-06													
					1849.473	3.01E-06													
					1849.454	3.56E-06													
					1849.435	3.24E-06													
					1849.415	3.09E-06													
					1849.396	3.47E-06													
					1849.377	3.66E-06													
					1849.358	3.56E-06													
					1849.338	3.48E-06													
					1849.319	3.41E-06													
					1849.3	3.23E-06													
					1849.281	3.18E-06													
					1849.262	3.48E-06													
					1849.242	3.19E-06													
					1849.223	2.77E-06													
					1849.204	3.25E-06													
					1849.185	3.17E-06													
					1849.165	3.2E-06													
					1849.146	3.31E-06													
					1849.127	3.05E-06													
					1849.108	2.95E-06													
					1849.088	3.14E-06													
					1849.069	3.45E-06													
					1849.05	3.31E-06													
					1849.031	3.06E-06													
					1849.012	3.25E-06													
					1848.992	3.19E-06													
					1848.973	3.13E-06													
					1848.954	3.18E-06													
					1848.935	3.25E-06													
					1848.915	3.4E-06													
					1848.896	3.37E-06													
					1848.877	3.49E-06													
					1848.858	3.58E-06													
					1848.838	3.81E-06													
					1848.819	3.58E-06													
					1848.8	3.49E-06													
					1848.781	3.54E-06													
					1848.762	3.46E-06													
					1848.742	3.4E-06													
					1848.723	3.65E-06													
					1848.704	3.66E-06													
					1848.685	3.52E-06													
					1848.665	3.76E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1848.646	3.46E-06													
					1848.627	3.5E-06													
					1848.608	3.45E-06													
					1848.588	3.67E-06													
					1848.569	3.54E-06													
					1848.55	3.48E-06													
					1848.534	3.59E-06													
					1848.517	3.54E-06													
					1848.501	3.64E-06													
					1848.484	3.3E-06													
					1848.468	3.24E-06													
					1848.452	3.6E-06													
					1848.435	3.55E-06													
					1848.419	3.36E-06													
					1848.402	3.44E-06													
					1848.386	3.47E-06													
					1848.37	3.54E-06													
					1848.353	3.5E-06													
					1848.337	3.55E-06													
					1848.32	3.18E-06													
					1848.304	3.63E-06													
					1848.288	3.77E-06													
					1848.271	3.44E-06													
					1848.255	3.72E-06													
					1848.239	4.01E-06													
					1848.222	3.58E-06													
					1848.206	3.31E-06													
					1848.189	3.58E-06													
					1848.173	3.55E-06													
					1848.157	3.63E-06													
					1848.14	3.55E-06													
					1848.124	3.57E-06													
					1848.107	3.61E-06													
					1848.091	3.65E-06													
					1848.075	3.35E-06													
					1848.058	3.33E-06													
					1848.042	3.71E-06													
					1848.025	3.71E-06													
					1848.009	3.66E-06													
					1847.993	3.6E-06													
					1847.976	3.75E-06													
					1847.96	3.61E-06													
					1847.943	3.8E-06													
					1847.927	3.73E-06													
					1847.911	3.84E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1847.894	3.73E-06													
					1847.878	3.75E-06													
					1847.861	3.76E-06													
					1847.845	3.87E-06													
					1847.829	3.77E-06													
					1847.812	3.61E-06													
					1847.796	3.3E-06													
					1847.78	3.4E-06													
					1847.763	3.38E-06													
					1847.747	3.34E-06													
					1847.73	3.36E-06													
					1847.714	3.63E-06													
					1847.698	3.13E-06													
					1847.681	3.21E-06													
					1847.665	3.26E-06													
					1847.648	3.29E-06													
					1847.632	3.44E-06													
					1847.616	3.71E-06													
					1847.599	3.51E-06													
					1847.583	3.63E-06													
					1847.566	3.4E-06													
					1847.55	3.75E-06													
					1847.534	3.38E-06													
					1847.518	3.25E-06													
					1847.502	3.75E-06													
					1847.485	3.68E-06													
					1847.469	3.57E-06													
					1847.453	3.6E-06													
					1847.437	3.91E-06													
					1847.421	3.78E-06													
					1847.405	3.56E-06													
					1847.389	3.48E-06													
					1847.373	3.43E-06													
					1847.356	3.44E-06													
					1847.34	3.37E-06													
					1847.324	3.54E-06													
					1847.308	3.48E-06													
					1847.292	3.49E-06													
					1847.276	3.37E-06													
					1847.26	3.48E-06													
					1847.244	3.43E-06													
					1847.227	3.53E-06													
					1847.211	3.63E-06													
					1847.195	3.51E-06													
					1847.179	3.42E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1847.163	3.3E-06													
					1847.147	3.37E-06													
					1847.131	3.05E-06													
					1847.115	3.21E-06													
					1847.098	3.42E-06													
					1847.082	3.46E-06													
					1847.066	3.62E-06													
					1847.05	3.52E-06													
					1847.034	3.4E-06													
					1847.018	3.67E-06													
					1847.002	3.4E-06													
					1846.985	3.7E-06													
					1846.969	3.57E-06													
					1846.953	3.26E-06													
					1846.937	3.59E-06													
					1846.921	3.53E-06													
					1846.905	3.57E-06													
					1846.889	3.77E-06													
					1846.873	3.83E-06													
					1846.856	0.000004													
					1846.84	3.82E-06													
					1846.824	3.57E-06													
					1846.808	4.15E-06													
					1846.792	4.34E-06													
					1846.776	4.24E-06													
					1846.76	4.08E-06													
					1846.744	4.05E-06													
					1846.727	3.64E-06													
					1846.711	4.03E-06													
					1846.695	4.15E-06													
					1846.679	4.17E-06													
					1846.663	4.16E-06													
					1846.647	3.8E-06													
					1846.631	3.82E-06													
					1846.615	4.05E-06													
					1846.598	4.2E-06													
					1846.582	4.38E-06													
					1846.566	3.87E-06													
					1846.55	3.98E-06													
					1846.531	3.94E-06													
					1846.512	3.92E-06													
					1846.493	4.18E-06													
					1846.475	4.37E-06													
					1846.456	4.69E-06													
					1846.437	4.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1846.418	3.97E-06													
					1846.399	4.14E-06													
					1846.38	4.3E-06													
					1846.361	4.93E-06													
					1846.342	5.56E-06													
					1846.324	5.56E-06													
					1846.305	5.77E-06													
					1846.286	4.87E-06													
					1846.267	4.21E-06													
					1846.248	4.16E-06													
					1846.229	4.09E-06													
					1846.21	3.7E-06													
					1846.192	3.67E-06													
					1846.173	3.79E-06													
					1846.154	3.53E-06													
					1846.135	3.32E-06													
					1846.116	3.67E-06													
					1846.097	3.52E-06													
					1846.078	3.72E-06													
					1846.059	3.65E-06													
					1846.041	3.67E-06													
					1846.022	3.63E-06													
					1846.003	3.38E-06													
					1845.984	3.4E-06													
					1845.965	3.42E-06													
					1845.946	3.19E-06													
					1845.927	3.37E-06													
					1845.908	3.35E-06													
					1845.89	3.43E-06													
					1845.871	3.37E-06													
					1845.852	3.42E-06													
					1845.833	3.49E-06													
					1845.814	3.44E-06													
					1845.795	3.27E-06													
					1845.776	3.23E-06													
					1845.758	3.1E-06													
					1845.739	3.45E-06													
					1845.72	3.65E-06													
					1845.701	3.79E-06													
					1845.682	3.64E-06													
					1845.663	3.57E-06													
					1845.644	3.39E-06													
					1845.625	3.69E-06													
					1845.607	3.44E-06													
					1845.588	3.68E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1845.569	3.5E-06													
					1845.55	3.35E-06													
					1845.538	3.56E-06													
					1845.526	3.84E-06													
					1845.514	3.64E-06													
					1845.502	3.61E-06													
					1845.49	3.94E-06													
					1845.478	3.83E-06													
					1845.466	3.65E-06													
					1845.454	3.55E-06													
					1845.442	3.39E-06													
					1845.43	3.72E-06													
					1845.417	3.48E-06													
					1845.405	3.55E-06													
					1845.393	3.4E-06													
					1845.381	3.45E-06													
					1845.369	3.32E-06													
					1845.357	3.38E-06													
					1845.345	3.41E-06													
					1845.333	3.47E-06													
					1845.321	4.09E-06													
					1845.309	3.65E-06													
					1845.297	3.7E-06													
					1845.285	3.48E-06													
					1845.273	3.63E-06													
					1845.261	3.65E-06													
					1845.249	3.69E-06													
					1845.237	3.63E-06													
					1845.225	3.65E-06													
					1845.213	3.47E-06													
					1845.201	3.25E-06													
					1845.189	3.32E-06													
					1845.177	3.41E-06													
					1845.164	3.37E-06													
					1845.152	3.61E-06													
					1845.14	3.42E-06													
					1845.128	3.47E-06													
					1845.116	3.62E-06													
					1845.104	3.49E-06													
					1845.092	3.55E-06													
					1845.08	3.44E-06													
					1845.068	3.41E-06													
					1845.056	3.53E-06													
					1845.044	3.6E-06													
					1845.032	3.57E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1845.02	3.63E-06													
					1845.008	3.51E-06													
					1844.996	3.5E-06													
					1844.984	3.54E-06													
					1844.972	3.54E-06													
					1844.96	3.64E-06													
					1844.948	3.58E-06													
					1844.936	3.52E-06													
					1844.923	3.54E-06													
					1844.911	3.59E-06													
					1844.899	3.39E-06													
					1844.887	3.36E-06													
					1844.875	3.5E-06													
					1844.863	3.36E-06													
					1844.851	3.32E-06													
					1844.839	3.5E-06													
					1844.827	3.36E-06													
					1844.815	3.52E-06													
					1844.803	3.68E-06													
					1844.791	3.38E-06													
					1844.779	3.47E-06													
					1844.767	3.57E-06													
					1844.755	3.55E-06													
					1844.743	3.35E-06													
					1844.731	3.53E-06													
					1844.719	3.63E-06													
					1844.707	3.38E-06													
					1844.695	3.67E-06													
					1844.683	3.52E-06													
					1844.67	3.69E-06													
					1844.658	3.76E-06													
					1844.646	3.45E-06													
					1844.634	3.44E-06													
					1844.622	3.53E-06													
					1844.61	3.76E-06													
					1844.598	3.92E-06													
					1844.586	3.89E-06													
					1844.574	3.59E-06													
					1844.562	3.84E-06													
					1844.55	3.66E-06													
					1844.538	3.39E-06													
					1844.525	3.49E-06													
					1844.513	3.69E-06													
					1844.501	3.89E-06													
					1844.488	3.98E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1844.476	3.68E-06													
					1844.464	3.48E-06													
					1844.451	3.5E-06													
					1844.439	3.37E-06													
					1844.427	3.68E-06													
					1844.414	3.55E-06													
					1844.402	3.73E-06													
					1844.39	3.73E-06													
					1844.377	4.13E-06													
					1844.365	3.63E-06													
					1844.352	4.24E-06													
					1844.34	3.83E-06													
					1844.328	4.08E-06													
					1844.315	3.92E-06													
					1844.303	3.83E-06													
					1844.291	3.51E-06													
					1844.278	3.7E-06													
					1844.266	3.34E-06													
					1844.254	3.91E-06													
					1844.241	3.9E-06													
					1844.229	3.51E-06													
					1844.217	3.45E-06													
					1844.204	3.25E-06													
					1844.192	3.7E-06													
					1844.18	3.64E-06													
					1844.167	3.87E-06													
					1844.155	3.58E-06													
					1844.143	3.91E-06													
					1844.13	3.65E-06													
					1844.118	3.42E-06													
					1844.106	3.73E-06													
					1844.093	3.44E-06													
					1844.081	3.29E-06													
					1844.069	3.23E-06													
					1844.056	3.78E-06													
					1844.044	3.4E-06													
					1844.031	3.5E-06													
					1844.019	3.1E-06													
					1844.007	3.05E-06													
					1843.994	3.01E-06													
					1843.982	3.72E-06													
					1843.97	3.52E-06													
					1843.957	3.58E-06													
					1843.945	3.71E-06													
					1843.933	3.67E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1843.92	3.71E-06													
					1843.908	3.73E-06													
					1843.896	3.3E-06													
					1843.883	3.46E-06													
					1843.871	3.59E-06													
					1843.859	3.05E-06													
					1843.846	3.63E-06													
					1843.834	3.97E-06													
					1843.822	3.5E-06													
					1843.809	3.56E-06													
					1843.797	3.56E-06													
					1843.785	3.54E-06													
					1843.772	3.5E-06													
					1843.76	3.54E-06													
					1843.748	3.25E-06													
					1843.735	3.43E-06													
					1843.723	3.65E-06													
					1843.71	3.47E-06													
					1843.698	3.36E-06													
					1843.686	3.44E-06													
					1843.673	3.39E-06													
					1843.661	3.56E-06													
					1843.649	3.47E-06													
					1843.636	3.55E-06													
					1843.624	3.54E-06													
					1843.612	3.98E-06													
					1843.599	3.71E-06													
					1843.587	3.14E-06													
					1843.575	3.45E-06													
					1843.562	3.1E-06													
					1843.55	3.15E-06													
					1843.537	3.27E-06													
					1843.524	3.72E-06													
					1843.511	3.78E-06													
					1843.498	3.79E-06													
					1843.485	3.64E-06													
					1843.472	4.2E-06													
					1843.459	3.21E-06													
					1843.446	3.56E-06													
					1843.433	3.22E-06													
					1843.42	3.08E-06													
					1843.407	3.47E-06													
					1843.394	4.2E-06													
					1843.381	3.33E-06													
					1843.368	3.24E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1843.355	3.21E-06													
					1843.342	3.17E-06													
					1843.329	3.19E-06													
					1843.316	3.49E-06													
					1843.303	3.24E-06													
					1843.29	3.46E-06													
					1843.277	3.22E-06													
					1843.264	3.21E-06													
					1843.251	3.05E-06													
					1843.238	3.28E-06													
					1843.225	2.89E-06													
					1843.212	3.07E-06													
					1843.199	2.97E-06													
					1843.186	2.87E-06													
					1843.173	3.02E-06													
					1843.16	3.35E-06													
					1843.147	2.92E-06													
					1843.134	3.1E-06													
					1843.121	2.85E-06													
					1843.108	3.19E-06													
					1843.095	3.77E-06													
					1843.082	3.27E-06													
					1843.069	2.91E-06													
					1843.056	2.95E-06													
					1843.044	3.3E-06													
					1843.031	3.48E-06													
					1843.018	3.16E-06													
					1843.005	3.27E-06													
					1842.992	3.16E-06													
					1842.979	3.25E-06													
					1842.966	2.88E-06													
					1842.953	2.85E-06													
					1842.94	3.27E-06													
					1842.927	3.51E-06													
					1842.914	3.2E-06													
					1842.901	3.58E-06													
					1842.888	3.38E-06													
					1842.875	3.25E-06													
					1842.862	3.39E-06													
					1842.849	2.97E-06													
					1842.836	3.01E-06													
					1842.823	2.83E-06													
					1842.81	2.92E-06													
					1842.797	2.89E-06													
					1842.784	3.22E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1842.771	3.03E-06													
					1842.758	3.09E-06													
					1842.745	3.12E-06													
					1842.732	3.15E-06													
					1842.719	3.11E-06													
					1842.706	3.53E-06													
					1842.693	3.81E-06													
					1842.68	3.6E-06													
					1842.667	3.29E-06													
					1842.654	3.8E-06													
					1842.641	3.84E-06													
					1842.628	3.31E-06													
					1842.615	2.77E-06													
					1842.602	2.98E-06													
					1842.589	3.58E-06													
					1842.576	3.18E-06													
					1842.563	2.82E-06													
					1842.55	3.09E-06													
					1842.526	3.53E-06													
					1842.501	3.86E-06													
					1842.477	3.53E-06													
					1842.452	3.45E-06													
					1842.428	3.16E-06													
					1842.404	2.98E-06													
					1842.379	3.07E-06													
					1842.355	3.34E-06													
					1842.33	3.31E-06													
					1842.306	3.36E-06													
					1842.282	3.21E-06													
					1842.257	3.29E-06													
					1842.233	3.2E-06													
					1842.209	3.06E-06													
					1842.184	3.01E-06													
					1842.16	3.01E-06													
					1842.135	2.99E-06													
					1842.111	3.24E-06													
					1842.087	3.2E-06													
					1842.062	3.33E-06													
					1842.038	3.28E-06													
					1842.013	3.35E-06													
					1841.989	3.51E-06													
					1841.965	3.49E-06													
					1841.94	3.54E-06													
					1841.916	3.41E-06													
					1841.891	3.77E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1841.867	3.72E-06													
					1841.843	3.24E-06													
					1841.818	3.42E-06													
					1841.794	3.54E-06													
					1841.77	3.54E-06													
					1841.745	3.55E-06													
					1841.721	3.33E-06													
					1841.696	3.29E-06													
					1841.672	3.31E-06													
					1841.648	3.25E-06													
					1841.623	3.12E-06													
					1841.599	3.2E-06													
					1841.574	3.2E-06													
					1841.55	3.25E-06													
					1841.53	3.24E-06													
					1841.511	3.36E-06													
					1841.491	3.41E-06													
					1841.472	3.38E-06													
					1841.452	3.31E-06													
					1841.432	3.44E-06													
					1841.413	3.39E-06													
					1841.393	3.41E-06													
					1841.374	3.49E-06													
					1841.354	3.62E-06													
					1841.334	3.45E-06													
					1841.315	3.27E-06													
					1841.295	3.25E-06													
					1841.275	3.69E-06													
					1841.256	3.71E-06													
					1841.236	3.71E-06													
					1841.217	3.52E-06													
					1841.197	3.54E-06													
					1841.177	3.72E-06													
					1841.158	3.58E-06													
					1841.138	2.96E-06													
					1841.119	3.07E-06													
					1841.099	3.36E-06													
					1841.079	3.42E-06													
					1841.06	3.33E-06													
					1841.04	3.56E-06													
					1841.021	3.58E-06													
					1841.001	3.6E-06													
					1840.981	3.67E-06													
					1840.962	3.64E-06													
					1840.942	3.66E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1840.923	3.41E-06													
					1840.903	3.57E-06													
					1840.883	3.38E-06													
					1840.864	3.55E-06													
					1840.844	3.36E-06													
					1840.825	3.49E-06													
					1840.805	3.75E-06													
					1840.785	3.8E-06													
					1840.766	4.01E-06													
					1840.746	4.03E-06													
					1840.726	3.78E-06													
					1840.707	3.76E-06													
					1840.687	3.63E-06													
					1840.668	3.78E-06													
					1840.648	3.74E-06													
					1840.628	3.5E-06													
					1840.609	3.43E-06													
					1840.589	3.45E-06													
					1840.57	3.38E-06													
					1840.55	3.44E-06													
					1840.528	3.56E-06													
					1840.507	3.47E-06													
					1840.485	3.53E-06													
					1840.463	3.56E-06													
					1840.441	3.87E-06													
					1840.42	3.42E-06													
					1840.398	3.51E-06													
					1840.376	3.37E-06													
					1840.354	3.35E-06													
					1840.333	3.41E-06													
					1840.311	3.3E-06													
					1840.289	3.41E-06													
					1840.267	3.52E-06													
					1840.246	3.83E-06													
					1840.224	3.66E-06													
					1840.202	4.07E-06													
					1840.18	4.16E-06													
					1840.159	4.33E-06													
					1840.137	4.12E-06													
					1840.115	3.87E-06													
					1840.093	3.76E-06													
					1840.072	3.86E-06													
					1840.05	3.76E-06													
					1840.028	3.39E-06													
					1840.007	3.57E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1839.985	3.57E-06													
					1839.963	3.66E-06													
					1839.941	3.55E-06													
					1839.92	3.66E-06													
					1839.898	3.57E-06													
					1839.876	3.73E-06													
					1839.854	3.57E-06													
					1839.833	3.66E-06													
					1839.811	3.62E-06													
					1839.789	3.58E-06													
					1839.767	3.52E-06													
					1839.746	3.57E-06													
					1839.724	3.61E-06													
					1839.702	3.9E-06													
					1839.68	3.65E-06													
					1839.659	3.72E-06													
					1839.637	3.87E-06													
					1839.615	3.67E-06													
					1839.593	3.59E-06													
					1839.572	3.57E-06													
					1839.55	3.64E-06													
					1839.536	3.46E-06													
					1839.523	3.38E-06													
					1839.509	3.63E-06													
					1839.496	3.72E-06													
					1839.482	3.54E-06													
					1839.469	3.45E-06													
					1839.455	3.46E-06													
					1839.442	3.31E-06													
					1839.428	3.35E-06													
					1839.415	3.28E-06													
					1839.401	3.43E-06													
					1839.388	3.44E-06													
					1839.374	3.51E-06													
					1839.361	3.5E-06													
					1839.347	3.51E-06													
					1839.334	3.34E-06													
					1839.32	3.31E-06													
					1839.307	3.54E-06													
					1839.293	3.59E-06													
					1839.28	3.69E-06													
					1839.266	3.84E-06													
					1839.253	3.62E-06													
					1839.239	3.45E-06													
					1839.226	3.45E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1839.212	3.71E-06													
					1839.199	3.45E-06													
					1839.185	3.48E-06													
					1839.172	3.48E-06													
					1839.158	3.69E-06													
					1839.145	4.09E-06													
					1839.131	3.95E-06													
					1839.118	3.69E-06													
					1839.104	3.74E-06													
					1839.091	3.69E-06													
					1839.077	3.7E-06													
					1839.064	3.69E-06													
					1839.05	3.52E-06													
					1839.036	3.6E-06													
					1839.023	3.4E-06													
					1839.009	3.54E-06													
					1838.996	3.45E-06													
					1838.982	3.57E-06													
					1838.969	3.38E-06													
					1838.955	3.42E-06													
					1838.942	3.53E-06													
					1838.928	4.01E-06													
					1838.915	3.73E-06													
					1838.901	4.04E-06													
					1838.888	3.63E-06													
					1838.874	3.79E-06													
					1838.861	3.68E-06													
					1838.847	3.15E-06													
					1838.834	3.31E-06													
					1838.82	3.36E-06													
					1838.807	3.2E-06													
					1838.793	3.44E-06													
					1838.78	3.69E-06													
					1838.766	3.73E-06													
					1838.753	3.68E-06													
					1838.739	3.77E-06													
					1838.726	4.1E-06													
					1838.712	4.13E-06													
					1838.699	4.17E-06													
					1838.685	4.23E-06													
					1838.672	4.2E-06													
					1838.658	3.8E-06													
					1838.645	0.000004													
					1838.631	3.84E-06													
					1838.618	4.04E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1838.604	3.97E-06													
					1838.591	4.37E-06													
					1838.577	3.64E-06													
					1838.564	3.65E-06													
					1838.55	3.53E-06													
					1838.51	3.5E-06													
					1838.47	3.64E-06													
					1838.43	3.81E-06													
					1838.39	3.83E-06													
					1838.35	4.04E-06													
					1838.31	3.83E-06													
					1838.27	3.81E-06													
					1838.23	3.66E-06													
					1838.19	3.34E-06													
					1838.15	3.56E-06													
					1838.11	3.45E-06													
					1838.07	3.47E-06													
					1838.03	3.82E-06													
					1837.99	3.7E-06													
					1837.95	3.79E-06													
					1837.91	3.87E-06													
					1837.87	3.7E-06													
					1837.83	3.85E-06													
					1837.79	3.88E-06													
					1837.75	3.91E-06													
					1837.71	4.21E-06													
					1837.67	4.3E-06													
					1837.63	4.16E-06													
					1837.59	4.05E-06													
					1837.55	3.9E-06													
					1837.53	3.88E-06													
					1837.51	3.75E-06													
					1837.49	3.61E-06													
					1837.47	3.52E-06													
					1837.45	3.44E-06													
					1837.43	3.32E-06													
					1837.41	3.42E-06													
					1837.39	3.28E-06													
					1837.37	3.17E-06													
					1837.35	3.63E-06													
					1837.33	3.54E-06													
					1837.31	3.61E-06													
					1837.29	3.46E-06													
					1837.27	3.6E-06													
					1837.25	3.88E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1837.23	3.64E-06													
					1837.21	3.48E-06													
					1837.19	3.76E-06													
					1837.17	3.51E-06													
					1837.15	3.62E-06													
					1837.13	3.52E-06													
					1837.11	3.59E-06													
					1837.09	3.32E-06													
					1837.07	3.28E-06													
					1837.05	3.38E-06													
					1837.03	3.53E-06													
					1837.01	3.61E-06													
					1836.99	3.51E-06													
					1836.97	3.68E-06													
					1836.95	3.43E-06													
					1836.93	3.3E-06													
					1836.91	3.56E-06													
					1836.89	2.99E-06													
					1836.87	2.48E-06													
					1836.85	2.96E-06													
					1836.83	3.09E-06													
					1836.81	2.85E-06													
					1836.79	2.56E-06													
					1836.77	2.56E-06													
					1836.75	2.65E-06													
					1836.73	2.71E-06													
					1836.71	2.71E-06													
					1836.69	3.12E-06													
					1836.67	3.18E-06													
					1836.65	2.56E-06													
					1836.63	2.39E-06													
					1836.61	3.67E-06													
					1836.59	3.56E-06													
					1836.57	3.48E-06													
					1836.55	3.71E-06													
					1836.53	3.87E-06													
					1836.511	3.85E-06													
					1836.491	3.7E-06													
					1836.472	4.05E-06													
					1836.452	4.44E-06													
					1836.432	3.95E-06													
					1836.413	3.79E-06													
					1836.393	4.12E-06													
					1836.374	3.79E-06													
					1836.354	3.72E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1836.334	3.54E-06													
					1836.315	3.61E-06													
					1836.295	3.57E-06													
					1836.275	3.59E-06													
					1836.256	3.52E-06													
					1836.236	3.76E-06													
					1836.217	3.56E-06													
					1836.197	3.47E-06													
					1836.177	3.47E-06													
					1836.158	3.38E-06													
					1836.138	3.53E-06													
					1836.119	3.39E-06													
					1836.099	3.43E-06													
					1836.079	3.6E-06													
					1836.06	3.82E-06													
					1836.04	3.85E-06													
					1836.021	3.61E-06													
					1836.001	3.81E-06													
					1835.981	3.66E-06													
					1835.962	3.62E-06													
					1835.942	3.66E-06													
					1835.923	3.76E-06													
					1835.903	3.72E-06													
					1835.883	3.75E-06													
					1835.864	3.68E-06													
					1835.844	3.8E-06													
					1835.825	3.86E-06													
					1835.805	3.86E-06													
					1835.785	3.93E-06													
					1835.766	3.87E-06													
					1835.746	3.56E-06													
					1835.726	3.47E-06													
					1835.707	3.75E-06													
					1835.687	3.5E-06													
					1835.668	3.33E-06													
					1835.648	3.5E-06													
					1835.628	3.92E-06													
					1835.609	3.7E-06													
					1835.589	3.76E-06													
					1835.57	3.75E-06													
					1835.55	3.59E-06													
					1835.513	3.64E-06													
					1835.476	3.57E-06													
					1835.439	3.49E-06													
					1835.402	3.73E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1835.365	3.82E-06													
					1835.328	3.85E-06													
					1835.291	3.77E-06													
					1835.254	3.68E-06													
					1835.217	3.46E-06													
					1835.18	3.58E-06													
					1835.143	3.65E-06													
					1835.106	3.59E-06													
					1835.069	3.52E-06													
					1835.031	3.72E-06													
					1834.994	3.5E-06													
					1834.957	3.58E-06													
					1834.92	3.55E-06													
					1834.883	3.23E-06													
					1834.846	3.45E-06													
					1834.809	3.13E-06													
					1834.772	3.13E-06													
					1834.735	3.21E-06													
					1834.698	3.53E-06													
					1834.661	3.63E-06													
					1834.624	3.94E-06													
					1834.587	3.91E-06													
					1834.55	3.8E-06													
					1834.508	3.58E-06													
					1834.467	3.76E-06													
					1834.425	3.82E-06													
					1834.383	3.29E-06													
					1834.342	3.38E-06													
					1834.3	3.25E-06													
					1834.258	3.17E-06													
					1834.217	3.31E-06													
					1834.175	3.38E-06													
					1834.133	3.51E-06													
					1834.092	3.54E-06													
					1834.05	3.44E-06													
					1834.008	3.58E-06													
					1833.967	3.54E-06													
					1833.925	3.65E-06													
					1833.883	3.4E-06													
					1833.842	3.34E-06													
					1833.8	3.24E-06													
					1833.758	3.25E-06													
					1833.717	3.27E-06													
					1833.675	3.27E-06													
					1833.633	3.28E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1833.592	3.21E-06													
					1833.55	3.2E-06													
					1833.53	3.17E-06													
					1833.51	3.44E-06													
					1833.49	3.54E-06													
					1833.47	3.66E-06													
					1833.45	3.67E-06													
					1833.43	3.49E-06													
					1833.41	3.39E-06													
					1833.39	3.44E-06													
					1833.37	3.42E-06													
					1833.35	3.48E-06													
					1833.33	3.61E-06													
					1833.31	3.7E-06													
					1833.29	3.69E-06													
					1833.27	3.58E-06													
					1833.25	3.67E-06													
					1833.23	3.54E-06													
					1833.21	3.69E-06													
					1833.19	3.67E-06													
					1833.17	3.9E-06													
					1833.15	3.75E-06													
					1833.13	3.77E-06													
					1833.11	3.6E-06													
					1833.09	3.62E-06													
					1833.07	3.78E-06													
					1833.05	3.48E-06													
					1833.03	3.44E-06													
					1833.01	3.3E-06													
					1832.99	3.23E-06													
					1832.97	3.22E-06													
					1832.95	3.32E-06													
					1832.93	3.54E-06													
					1832.91	3.46E-06													
					1832.89	3.55E-06													
					1832.87	3.67E-06													
					1832.85	3.81E-06													
					1832.83	3.84E-06													
					1832.81	3.65E-06													
					1832.79	3.48E-06													
					1832.77	3.5E-06													
					1832.75	3.34E-06													
					1832.73	3.22E-06													
					1832.71	3.17E-06													
					1832.69	2.98E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1832.67	3.29E-06													
					1832.65	3.37E-06													
					1832.63	3.28E-06													
					1832.61	3.35E-06													
					1832.59	3.2E-06													
					1832.57	3.18E-06													
					1832.55	3.36E-06													
					1832.529	3.58E-06													
					1832.507	3.71E-06													
					1832.486	3.67E-06													
					1832.465	3.48E-06													
					1832.444	3.69E-06													
					1832.422	3.54E-06													
					1832.401	3.5E-06													
					1832.38	3.23E-06													
					1832.359	3.23E-06													
					1832.337	3.13E-06													
					1832.316	3.47E-06													
					1832.295	3.71E-06													
					1832.273	3.67E-06													
					1832.252	3.58E-06													
					1832.231	3.63E-06													
					1832.21	3.46E-06													
					1832.188	3.43E-06													
					1832.167	3.44E-06													
					1832.146	3.27E-06													
					1832.124	3.25E-06													
					1832.103	3.28E-06													
					1832.082	3.15E-06													
					1832.061	3.29E-06													
					1832.039	3.56E-06													
					1832.018	3.65E-06													
					1831.997	3.6E-06													
					1831.976	3.39E-06													
					1831.954	3.29E-06													
					1831.933	3.16E-06													
					1831.912	3.28E-06													
					1831.89	3.09E-06													
					1831.869	3.29E-06													
					1831.848	3.08E-06													
					1831.827	3.19E-06													
					1831.805	3.22E-06													
					1831.784	3.22E-06													
					1831.763	3.29E-06													
					1831.741	3.47E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1831.72	3.44E-06													
					1831.699	3.42E-06													
					1831.678	3.36E-06													
					1831.656	3.36E-06													
					1831.635	3.43E-06													
					1831.614	3.32E-06													
					1831.593	3.41E-06													
					1831.571	3.6E-06													
					1831.55	3.19E-06													
					1831.533	3.41E-06													
					1831.516	3.29E-06													
					1831.498	3.15E-06													
					1831.481	3.26E-06													
					1831.464	3.11E-06													
					1831.447	3.26E-06													
					1831.429	3.24E-06													
					1831.412	3.36E-06													
					1831.395	3.14E-06													
					1831.378	3.36E-06													
					1831.36	3.38E-06													
					1831.343	3.33E-06													
					1831.326	3.59E-06													
					1831.309	3.33E-06													
					1831.291	3.47E-06													
					1831.274	3.7E-06													
					1831.257	3.63E-06													
					1831.24	3.58E-06													
					1831.222	3.87E-06													
					1831.205	3.75E-06													
					1831.188	4.01E-06													
					1831.171	3.89E-06													
					1831.153	3.6E-06													
					1831.136	3.47E-06													
					1831.119	3.49E-06													
					1831.102	3.54E-06													
					1831.084	3.4E-06													
					1831.067	3.26E-06													
					1831.05	3.23E-06													
					1831.033	3.22E-06													
					1831.016	3.23E-06													
					1830.998	3.3E-06													
					1830.981	3.26E-06													
					1830.964	3.48E-06													
					1830.947	3.35E-06													
					1830.929	3.39E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1830.912	3.39E-06													
					1830.895	3.3E-06													
					1830.878	3.33E-06													
					1830.86	3.26E-06													
					1830.843	3.21E-06													
					1830.826	3.21E-06													
					1830.809	3.16E-06													
					1830.791	3.11E-06													
					1830.774	3.07E-06													
					1830.757	3.2E-06													
					1830.74	3.5E-06													
					1830.722	3.55E-06													
					1830.705	3.62E-06													
					1830.688	3.64E-06													
					1830.671	3.8E-06													
					1830.653	3.69E-06													
					1830.636	3.58E-06													
					1830.619	3.68E-06													
					1830.602	3.41E-06													
					1830.584	3.57E-06													
					1830.567	3.23E-06													
					1830.55	3.16E-06													
					1830.531	3.46E-06													
					1830.512	3.3E-06													
					1830.492	3.47E-06													
					1830.473	3.39E-06													
					1830.454	3.42E-06													
					1830.435	3.34E-06													
					1830.415	3.42E-06													
					1830.396	3.42E-06													
					1830.377	3.17E-06													
					1830.358	3.27E-06													
					1830.338	3.1E-06													
					1830.319	3.27E-06													
					1830.3	3.7E-06													
					1830.281	3.5E-06													
					1830.262	3.29E-06													
					1830.242	3.12E-06													
					1830.223	3.2E-06													
					1830.204	3.27E-06													
					1830.185	3.29E-06													
					1830.165	3.4E-06													
					1830.146	3.5E-06													
					1830.127	3.67E-06													
					1830.108	3.41E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1830.088	3.4E-06													
					1830.069	3.29E-06													
					1830.05	3.36E-06													
					1830.031	3.16E-06													
					1830.012	3.14E-06													
					1829.992	3.14E-06													
					1829.973	3.19E-06													
					1829.954	3.39E-06													
					1829.935	3.67E-06													
					1829.915	3.39E-06													
					1829.896	3.43E-06													
					1829.877	3.56E-06													
					1829.858	3.79E-06													
					1829.838	3.61E-06													
					1829.819	3.46E-06													
					1829.8	3.48E-06													
					1829.781	3.17E-06													
					1829.762	3.28E-06													
					1829.742	3.31E-06													
					1829.723	3.39E-06													
					1829.704	3.51E-06													
					1829.685	3.52E-06													
					1829.665	3.37E-06													
					1829.646	3.43E-06													
					1829.627	3.53E-06													
					1829.608	3.5E-06													
					1829.588	3.68E-06													
					1829.569	3.59E-06													
					1829.55	3.58E-06													
					1829.53	3.55E-06													
					1829.509	3.49E-06													
					1829.489	3.42E-06													
					1829.468	3.02E-06													
					1829.448	3.19E-06													
					1829.428	3.29E-06													
					1829.407	3.19E-06													
					1829.387	3.12E-06													
					1829.366	3.34E-06													
					1829.346	3.46E-06													
					1829.326	3.56E-06													
					1829.305	3.37E-06													
					1829.285	3.3E-06													
					1829.264	3.35E-06													
					1829.244	3.2E-06													
					1829.223	3.24E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1829.203	3.34E-06													
					1829.183	3.47E-06													
					1829.162	3.24E-06													
					1829.142	3.2E-06													
					1829.121	2.92E-06													
					1829.101	3.14E-06													
					1829.081	3.08E-06													
					1829.06	3.27E-06													
					1829.04	3.4E-06													
					1829.019	3.44E-06													
					1828.999	3.21E-06													
					1828.979	3.2E-06													
					1828.958	3.14E-06													
					1828.938	3.17E-06													
					1828.917	3.23E-06													
					1828.897	3.23E-06													
					1828.877	3.28E-06													
					1828.856	3.19E-06													
					1828.836	3.33E-06													
					1828.815	3.12E-06													
					1828.795	3.32E-06													
					1828.774	3.42E-06													
					1828.754	3.5E-06													
					1828.734	3.47E-06													
					1828.713	3.24E-06													
					1828.693	3.22E-06													
					1828.672	3.1E-06													
					1828.652	3.36E-06													
					1828.632	3.26E-06													
					1828.611	3.11E-06													
					1828.591	2.96E-06													
					1828.57	3.2E-06													
					1828.55	3.24E-06													
					1828.527	3.3E-06													
					1828.505	3.12E-06													
					1828.482	3.03E-06													
					1828.459	3.18E-06													
					1828.436	2.91E-06													
					1828.414	3.05E-06													
					1828.391	3.22E-06													
					1828.368	3.35E-06													
					1828.345	3.28E-06													
					1828.323	3.46E-06													
					1828.3	3.41E-06													
					1828.277	3.38E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1828.255	3.17E-06													
					1828.232	0.000003													
					1828.209	2.99E-06													
					1828.186	3.23E-06													
					1828.164	2.99E-06													
					1828.141	3.14E-06													
					1828.118	3.46E-06													
					1828.095	3.37E-06													
					1828.073	3.3E-06													
					1828.05	3.23E-06													
					1828.027	3.38E-06													
					1828.005	3.28E-06													
					1827.982	3.34E-06													
					1827.959	3.43E-06													
					1827.936	3.18E-06													
					1827.914	3.34E-06													
					1827.891	3.29E-06													
					1827.868	3.25E-06													
					1827.845	3.14E-06													
					1827.823	3.19E-06													
					1827.8	3.24E-06													
					1827.777	3.44E-06													
					1827.755	3.24E-06													
					1827.732	3.21E-06													
					1827.709	3.38E-06													
					1827.686	3.38E-06													
					1827.664	3.23E-06													
					1827.641	3.25E-06													
					1827.618	3.04E-06													
					1827.595	3.13E-06													
					1827.573	3.19E-06													
					1827.55	3.2E-06													
					1827.533	3.41E-06													
					1827.516	3.11E-06													
					1827.499	3.53E-06													
					1827.482	3.17E-06													
					1827.465	3.51E-06													
					1827.448	3.64E-06													
					1827.431	3.45E-06													
					1827.414	3.44E-06													
					1827.397	3.88E-06													
					1827.381	3.57E-06													
					1827.364	3.38E-06													
					1827.347	3.23E-06													
					1827.33	3.07E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1827.313	3.4E-06													
					1827.296	3.49E-06													
					1827.279	3.22E-06													
					1827.262	2.85E-06													
					1827.245	2.85E-06													
					1827.228	2.9E-06													
					1827.211	3.23E-06													
					1827.194	3.4E-06													
					1827.177	3.41E-06													
					1827.16	3.48E-06													
					1827.143	3.56E-06													
					1827.126	3.63E-06													
					1827.109	3.6E-06													
					1827.092	3.58E-06													
					1827.075	3.5E-06													
					1827.058	3.53E-06													
					1827.042	3.28E-06													
					1827.025	3.28E-06													
					1827.008	3.25E-06													
					1826.991	3.51E-06													
					1826.974	3.61E-06													
					1826.957	3.75E-06													
					1826.94	3.49E-06													
					1826.923	3.61E-06													
					1826.906	3.68E-06													
					1826.889	3.37E-06													
					1826.872	3.22E-06													
					1826.855	3.37E-06													
					1826.838	3.53E-06													
					1826.821	3.47E-06													
					1826.804	3.48E-06													
					1826.787	3.43E-06													
					1826.77	3.18E-06													
					1826.753	3.03E-06													
					1826.736	3.07E-06													
					1826.719	3.06E-06													
					1826.703	3.13E-06													
					1826.686	3.21E-06													
					1826.669	3.28E-06													
					1826.652	3.45E-06													
					1826.635	3.61E-06													
					1826.618	3.34E-06													
					1826.601	3.33E-06													
					1826.584	3.27E-06													
					1826.567	3.17E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1826.55	3.25E-06													
					1826.532	3.54E-06													
					1826.514	3.52E-06													
					1826.495	3.75E-06													
					1826.477	3.64E-06													
					1826.459	3.74E-06													
					1826.441	3.62E-06													
					1826.423	3.24E-06													
					1826.405	3.3E-06													
					1826.386	4.05E-06													
					1826.368	3.91E-06													
					1826.35	3.57E-06													
					1826.332	3.52E-06													
					1826.314	3.47E-06													
					1826.295	3.51E-06													
					1826.277	3.51E-06													
					1826.259	3.25E-06													
					1826.241	3.31E-06													
					1826.223	3.32E-06													
					1826.205	3.37E-06													
					1826.186	3.3E-06													
					1826.168	3.13E-06													
					1826.15	3.17E-06													
					1826.132	3.22E-06													
					1826.114	3.33E-06													
					1826.095	3.52E-06													
					1826.077	3.42E-06													
					1826.059	3.33E-06													
					1826.041	3.22E-06													
					1826.023	3.16E-06													
					1826.005	3.15E-06													
					1825.986	3.1E-06													
					1825.968	3.01E-06													
					1825.95	3.05E-06													
					1825.932	3.03E-06													
					1825.914	3.23E-06													
					1825.895	3.04E-06													
					1825.877	2.83E-06													
					1825.859	2.91E-06													
					1825.841	3.02E-06													
					1825.823	3.12E-06													
					1825.805	3.1E-06													
					1825.786	3.09E-06													
					1825.768	3.24E-06													
					1825.75	3.5E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1825.732	3.34E-06													
					1825.714	3.24E-06													
					1825.695	3.52E-06													
					1825.677	3.45E-06													
					1825.659	3.23E-06													
					1825.641	3.09E-06													
					1825.623	3.21E-06													
					1825.605	3.33E-06													
					1825.586	3.19E-06													
					1825.568	3.1E-06													
					1825.55	3.09E-06													
					1825.532	2.91E-06													
					1825.514	3.33E-06													
					1825.496	3.35E-06													
					1825.479	3.33E-06													
					1825.461	3.26E-06													
					1825.443	3.52E-06													
					1825.425	3.8E-06													
					1825.407	4.12E-06													
					1825.389	4.6E-06													
					1825.371	4.04E-06													
					1825.354	3.57E-06													
					1825.336	3.5E-06													
					1825.318	3.43E-06													
					1825.3	3.3E-06													
					1825.282	3.21E-06													
					1825.264	3.55E-06													
					1825.246	3.66E-06													
					1825.229	3.35E-06													
					1825.211	3.46E-06													
					1825.193	3.42E-06													
					1825.175	3.2E-06													
					1825.157	3.17E-06													
					1825.139	3.03E-06													
					1825.121	2.96E-06													
					1825.104	3.04E-06													
					1825.086	2.95E-06													
					1825.068	3.11E-06													
					1825.05	3.16E-06													
					1825.032	3.27E-06													
					1825.014	3.23E-06													
					1824.996	3.33E-06													
					1824.979	3.23E-06													
					1824.961	3.16E-06													
					1824.943	3.14E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1824.925	3.05E-06													
					1824.907	3.06E-06													
					1824.889	3.3E-06													
					1824.871	3.49E-06													
					1824.854	3.36E-06													
					1824.836	3.41E-06													
					1824.818	3.34E-06													
					1824.8	3.17E-06													
					1824.782	3.15E-06													
					1824.764	3.27E-06													
					1824.746	3.26E-06													
					1824.729	3.27E-06													
					1824.711	3.19E-06													
					1824.693	3.19E-06													
					1824.675	3.18E-06													
					1824.657	3.3E-06													
					1824.639	3.42E-06													
					1824.621	3.38E-06													
					1824.604	3.44E-06													
					1824.586	3.41E-06													
					1824.568	3.46E-06													
					1824.55	3.58E-06													
					1824.527	3.43E-06													
					1824.503	3.44E-06													
					1824.48	3.53E-06													
					1824.457	3.36E-06													
					1824.434	3.29E-06													
					1824.41	3.16E-06													
					1824.387	3.13E-06													
					1824.364	3.15E-06													
					1824.341	3.1E-06													
					1824.317	2.95E-06													
					1824.294	2.99E-06													
					1824.271	3.2E-06													
					1824.248	3.47E-06													
					1824.224	2.97E-06													
					1824.201	3.13E-06													
					1824.178	3.17E-06													
					1824.155	3.26E-06													
					1824.131	3.13E-06													
					1824.108	3.28E-06													
					1824.085	3.5E-06													
					1824.062	3.44E-06													
					1824.038	3.26E-06													
					1824.015	3.31E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1823.992	3.37E-06													
					1823.969	3.22E-06													
					1823.945	3.24E-06													
					1823.922	3.26E-06													
					1823.899	3.33E-06													
					1823.876	3.35E-06													
					1823.852	3.33E-06													
					1823.829	3.29E-06													
					1823.806	3.43E-06													
					1823.783	3.68E-06													
					1823.759	3.66E-06													
					1823.736	3.7E-06													
					1823.713	3.52E-06													
					1823.69	3.26E-06													
					1823.666	3.83E-06													
					1823.643	3.66E-06													
					1823.62	3.54E-06													
					1823.597	3.53E-06													
					1823.573	3.45E-06													
					1823.55	3.52E-06													
					1823.528	3.54E-06													
					1823.506	3.62E-06													
					1823.483	3.48E-06													
					1823.461	3.54E-06													
					1823.439	3.51E-06													
					1823.417	3.39E-06													
					1823.394	3.17E-06													
					1823.372	3.19E-06													
					1823.35	3.11E-06													
					1823.328	3.05E-06													
					1823.306	2.96E-06													
					1823.283	3.17E-06													
					1823.261	3.24E-06													
					1823.239	3.28E-06													
					1823.217	3.2E-06													
					1823.194	3.38E-06													
					1823.172	3.38E-06													
					1823.15	3.34E-06													
					1823.128	3.33E-06													
					1823.106	3.57E-06													
					1823.083	3.46E-06													
					1823.061	3.67E-06													
					1823.039	3.15E-06													
					1823.017	3.23E-06													
					1822.994	3.07E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1822.972	3.16E-06													
					1822.95	3.2E-06													
					1822.928	3.17E-06													
					1822.906	3.58E-06													
					1822.883	3.34E-06													
					1822.861	3.76E-06													
					1822.839	3.69E-06													
					1822.817	3.72E-06													
					1822.794	4.07E-06													
					1822.772	4.08E-06													
					1822.75	3.84E-06													
					1822.728	3.81E-06													
					1822.706	3.42E-06													
					1822.683	3.44E-06													
					1822.661	3.23E-06													
					1822.639	3.17E-06													
					1822.617	3.46E-06													
					1822.594	3.47E-06													
					1822.572	3.54E-06													
					1822.55	3.76E-06													
					1822.533	3.46E-06													
					1822.516	3.7E-06													
					1822.498	3.68E-06													
					1822.481	3.72E-06													
					1822.464	3.78E-06													
					1822.447	3.71E-06													
					1822.429	3.57E-06													
					1822.412	3.51E-06													
					1822.395	3.42E-06													
					1822.378	3.51E-06													
					1822.36	3.39E-06													
					1822.343	3.38E-06													
					1822.326	3.26E-06													
					1822.309	3.21E-06													
					1822.291	3.13E-06													
					1822.274	3.05E-06													
					1822.257	3.41E-06													
					1822.24	3.2E-06													
					1822.222	3.25E-06													
					1822.205	3.34E-06													
					1822.188	3.57E-06													
					1822.171	3.67E-06													
					1822.153	3.94E-06													
					1822.136	3.83E-06													
					1822.119	3.34E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1822.102	3.29E-06													
					1822.084	3.2E-06													
					1822.067	3.38E-06													
					1822.05	3.31E-06													
					1822.033	3.11E-06													
					1822.016	3.27E-06													
					1821.998	3.09E-06													
					1821.981	3.15E-06													
					1821.964	3.13E-06													
					1821.947	3.04E-06													
					1821.929	3.31E-06													
					1821.912	3.17E-06													
					1821.895	3.17E-06													
					1821.878	3.13E-06													
					1821.86	3.42E-06													
					1821.843	3.59E-06													
					1821.826	3.44E-06													
					1821.809	3.48E-06													
					1821.791	3.44E-06													
					1821.774	3.29E-06													
					1821.757	3.16E-06													
					1821.74	3.18E-06													
					1821.722	3.27E-06													
					1821.705	3.33E-06													
					1821.688	3.26E-06													
					1821.671	3.03E-06													
					1821.653	2.98E-06													
					1821.636	2.96E-06													
					1821.619	3.02E-06													
					1821.602	3.12E-06													
					1821.584	2.8E-06													
					1821.567	2.93E-06													
					1821.55	3.03E-06													
					1821.534	2.9E-06													
					1821.519	2.97E-06													
					1821.503	2.87E-06													
					1821.488	2.92E-06													
					1821.472	2.75E-06													
					1821.456	2.74E-06													
					1821.441	2.83E-06													
					1821.425	2.77E-06													
					1821.409	2.64E-06													
					1821.394	2.67E-06													
					1821.378	2.53E-06													
					1821.363	2.48E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1821.347	2.73E-06													
					1821.331	2.76E-06													
					1821.316	2.87E-06													
					1821.3	2.64E-06													
					1821.284	2.87E-06													
					1821.269	2.9E-06													
					1821.253	2.76E-06													
					1821.238	2.75E-06													
					1821.222	2.8E-06													
					1821.206	3.18E-06													
					1821.191	3.09E-06													
					1821.175	2.94E-06													
					1821.159	3.01E-06													
					1821.144	3.28E-06													
					1821.128	3.67E-06													
					1821.113	3.98E-06													
					1821.097	3.67E-06													
					1821.081	3.69E-06													
					1821.066	3.51E-06													
					1821.05	3.66E-06													
					1821.034	4.02E-06													
					1821.019	3.59E-06													
					1821.003	3.28E-06													
					1820.988	3.56E-06													
					1820.972	3.63E-06													
					1820.956	3.61E-06													
					1820.941	3.48E-06													
					1820.925	3.41E-06													
					1820.909	3.58E-06													
					1820.894	3.66E-06													
					1820.878	3.74E-06													
					1820.863	3.81E-06													
					1820.847	3.55E-06													
					1820.831	3.52E-06													
					1820.816	3.43E-06													
					1820.8	3.49E-06													
					1820.784	3.39E-06													
					1820.769	3.61E-06													
					1820.753	3.95E-06													
					1820.738	3.67E-06													
					1820.722	3.57E-06													
					1820.706	3.74E-06													
					1820.691	3.72E-06													
					1820.675	3.43E-06													
					1820.659	3.5E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1820.644	3.41E-06													
					1820.628	3.22E-06													
					1820.613	3.2E-06													
					1820.597	3.73E-06													
					1820.581	3.62E-06													
					1820.566	3.51E-06													
					1820.55	3.73E-06													
					1820.528	4.14E-06													
					1820.506	4.29E-06													
					1820.483	4.1E-06													
					1820.461	4.09E-06													
					1820.439	3.9E-06													
					1820.417	3.82E-06													
					1820.394	3.52E-06													
					1820.372	3.89E-06													
					1820.35	3.55E-06													
					1820.328	4.05E-06													
					1820.306	4.35E-06													
					1820.283	4.04E-06													
					1820.261	3.94E-06													
					1820.239	3.85E-06													
					1820.217	3.88E-06													
					1820.194	3.66E-06													
					1820.172	3.68E-06													
					1820.15	3.65E-06													
					1820.128	3.71E-06													
					1820.106	3.44E-06													
					1820.083	3.5E-06													
					1820.061	3.53E-06													
					1820.039	3.47E-06													
					1820.017	3.72E-06													
					1819.994	3.55E-06													
					1819.972	3.61E-06													
					1819.95	3.51E-06													
					1819.928	3.61E-06													
					1819.906	3.69E-06													
					1819.883	3.6E-06													
					1819.861	3.1E-06													
					1819.839	3.62E-06													
					1819.817	3.57E-06													
					1819.794	3.91E-06													
					1819.772	3.82E-06													
					1819.75	3.19E-06													
					1819.728	3.73E-06													
					1819.706	3.98E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1819.683	4.1E-06													
					1819.661	3.89E-06													
					1819.639	3.56E-06													
					1819.617	4.22E-06													
					1819.594	4.19E-06													
					1819.572	4.09E-06													
					1819.55	4.06E-06													
					1819.534	4.09E-06													
					1819.518	4.39E-06													
					1819.502	4.62E-06													
					1819.487	3.94E-06													
					1819.471	4.09E-06													
					1819.455	3.91E-06													
					1819.439	3.91E-06													
					1819.423	3.82E-06													
					1819.407	3.94E-06													
					1819.391	3.8E-06													
					1819.375	3.66E-06													
					1819.36	3.89E-06													
					1819.344	3.7E-06													
					1819.328	4.04E-06													
					1819.312	4.48E-06													
					1819.296	5.16E-06													
					1819.28	5.09E-06													
					1819.264	5.37E-06													
					1819.248	0.000005													
					1819.233	4.28E-06													
					1819.217	4.07E-06													
					1819.201	3.74E-06													
					1819.185	3.71E-06													
					1819.169	3.65E-06													
					1819.153	3.36E-06													
					1819.137	3.52E-06													
					1819.121	3.58E-06													
					1819.106	3.51E-06													
					1819.09	3.43E-06													
					1819.074	3.26E-06													
					1819.058	3.79E-06													
					1819.042	3.47E-06													
					1819.026	3.62E-06													
					1819.01	3.69E-06													
					1818.994	3.55E-06													
					1818.979	3.98E-06													
					1818.963	3.62E-06													
					1818.947	3.76E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1818.931	3.6E-06													
					1818.915	3.61E-06													
					1818.899	3.89E-06													
					1818.883	3.41E-06													
					1818.867	3.68E-06													
					1818.852	3.68E-06													
					1818.836	3.7E-06													
					1818.82	3.6E-06													
					1818.804	3.55E-06													
					1818.788	3.6E-06													
					1818.772	3.23E-06													
					1818.756	3.32E-06													
					1818.74	3.72E-06													
					1818.725	3.38E-06													
					1818.709	3.31E-06													
					1818.693	3.75E-06													
					1818.677	3.47E-06													
					1818.661	3.92E-06													
					1818.645	3.8E-06													
					1818.629	4.14E-06													
					1818.613	3.7E-06													
					1818.598	3.93E-06													
					1818.582	4.1E-06													
					1818.566	3.66E-06													
					1818.55	3.65E-06													
					1818.53	3.77E-06													
					1818.511	3.8E-06													
					1818.491	3.61E-06													
					1818.472	3.93E-06													
					1818.452	3.97E-06													
					1818.432	3.66E-06													
					1818.413	3.64E-06													
					1818.393	3.45E-06													
					1818.374	3.4E-06													
					1818.354	3.45E-06													
					1818.334	3.26E-06													
					1818.315	3.49E-06													
					1818.295	3.83E-06													
					1818.275	3.59E-06													
					1818.256	3.41E-06													
					1818.236	3.05E-06													
					1818.217	3.36E-06													
					1818.197	3.34E-06													
					1818.177	3.05E-06													
					1818.158	3.33E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1818.138	3.57E-06													
					1818.119	3.68E-06													
					1818.099	3.73E-06													
					1818.079	3.58E-06													
					1818.06	3.5E-06													
					1818.04	3.44E-06													
					1818.021	3.44E-06													
					1818.001	3.57E-06													
					1817.981	3.68E-06													
					1817.962	3.52E-06													
					1817.942	3.65E-06													
					1817.923	3.49E-06													
					1817.903	3.55E-06													
					1817.883	3.44E-06													
					1817.864	3.37E-06													
					1817.844	3.3E-06													
					1817.825	3.39E-06													
					1817.805	3.89E-06													
					1817.785	3.81E-06													
					1817.766	3.41E-06													
					1817.746	3.46E-06													
					1817.726	3.51E-06													
					1817.707	3.49E-06													
					1817.687	3.54E-06													
					1817.668	3.42E-06													
					1817.648	3.14E-06													
					1817.628	3.25E-06													
					1817.609	3.21E-06													
					1817.589	3.44E-06													
					1817.57	3.67E-06													
					1817.55	3.69E-06													
					1817.523	3.43E-06													
					1817.496	3.44E-06													
					1817.469	3.24E-06													
					1817.442	3.24E-06													
					1817.415	3.38E-06													
					1817.388	3.68E-06													
					1817.361	3.83E-06													
					1817.334	3.44E-06													
					1817.307	3.2E-06													
					1817.28	3.67E-06													
					1817.253	3.61E-06													
					1817.226	3.52E-06													
					1817.199	3.93E-06													
					1817.172	3.81E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1817.145	3.79E-06													
					1817.118	3.76E-06													
					1817.091	3.66E-06													
					1817.064	3.48E-06													
					1817.036	3.09E-06													
					1817.009	3.62E-06													
					1816.982	3.27E-06													
					1816.955	3.47E-06													
					1816.928	3.41E-06													
					1816.901	3.51E-06													
					1816.874	3.51E-06													
					1816.847	3.78E-06													
					1816.82	3.42E-06													
					1816.793	3.55E-06													
					1816.766	3.85E-06													
					1816.739	4.03E-06													
					1816.712	3.99E-06													
					1816.685	3.79E-06													
					1816.658	3.97E-06													
					1816.631	4.25E-06													
					1816.604	4.32E-06													
					1816.577	4.3E-06													
					1816.55	3.94E-06													
					1816.526	3.92E-06													
					1816.502	3.93E-06													
					1816.479	3.77E-06													
					1816.455	3.66E-06													
					1816.431	4.15E-06													
					1816.407	4.39E-06													
					1816.383	3.9E-06													
					1816.36	3.8E-06													
					1816.336	3.88E-06													
					1816.312	3.75E-06													
					1816.288	3.37E-06													
					1816.264	3.21E-06													
					1816.24	3.14E-06													
					1816.217	3.03E-06													
					1816.193	3.21E-06													
					1816.169	3.4E-06													
					1816.145	3.52E-06													
					1816.121	3.38E-06													
					1816.098	3.64E-06													
					1816.074	3.53E-06													
					1816.05	3.48E-06													
					1816.026	3.26E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1816.002	3.22E-06													
					1815.979	3.48E-06													
					1815.955	3.39E-06													
					1815.931	3.41E-06													
					1815.907	3.7E-06													
					1815.883	3.96E-06													
					1815.86	0.000004													
					1815.836	3.67E-06													
					1815.812	3.52E-06													
					1815.788	3.62E-06													
					1815.764	3.5E-06													
					1815.74	3.4E-06													
					1815.717	3.28E-06													
					1815.693	3.2E-06													
					1815.669	3.42E-06													
					1815.645	3.12E-06													
					1815.621	3.24E-06													
					1815.598	3.44E-06													
					1815.574	3.41E-06													
					1815.55	3.35E-06													
					1815.521	3.14E-06													
					1815.493	3.28E-06													
					1815.464	3.25E-06													
					1815.436	3.76E-06													
					1815.407	3.64E-06													
					1815.379	3.54E-06													
					1815.35	3.77E-06													
					1815.321	3.78E-06													
					1815.293	3.81E-06													
					1815.264	3.93E-06													
					1815.236	3.81E-06													
					1815.207	3.71E-06													
					1815.179	3.61E-06													
					1815.15	3.58E-06													
					1815.121	3.55E-06													
					1815.093	3.88E-06													
					1815.064	3.86E-06													
					1815.036	3.7E-06													
					1815.007	3.53E-06													
					1814.979	3.32E-06													
					1814.95	3.18E-06													
					1814.921	3.49E-06													
					1814.893	3.59E-06													
					1814.864	3.68E-06													
					1814.836	3.48E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1814.807	3.54E-06													
					1814.779	3.4E-06													
					1814.75	3.35E-06													
					1814.721	3.14E-06													
					1814.693	3.11E-06													
					1814.664	3.32E-06													
					1814.636	3.46E-06													
					1814.607	3.24E-06													
					1814.579	3.09E-06													
					1814.55	3.24E-06													
					1814.532	3.52E-06													
					1814.514	3.83E-06													
					1814.496	3.7E-06													
					1814.479	3.54E-06													
					1814.461	3.37E-06													
					1814.443	3.58E-06													
					1814.425	4.07E-06													
					1814.407	3.96E-06													
					1814.389	4.03E-06													
					1814.371	0.000004													
					1814.354	0.000004													
					1814.336	3.88E-06													
					1814.318	3.89E-06													
					1814.3	4.09E-06													
					1814.282	3.74E-06													
					1814.264	3.72E-06													
					1814.246	3.9E-06													
					1814.229	3.62E-06													
					1814.211	3.88E-06													
					1814.193	3.93E-06													
					1814.175	3.79E-06													
					1814.157	3.67E-06													
					1814.139	3.88E-06													
					1814.121	4.05E-06													
					1814.104	4.07E-06													
					1814.086	3.9E-06													
					1814.068	4.32E-06													
					1814.05	4.17E-06													
					1814.032	3.81E-06													
					1814.014	3.9E-06													
					1813.996	3.82E-06													
					1813.979	3.6E-06													
					1813.961	3.61E-06													
					1813.943	3.72E-06													
					1813.925	3.84E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1813.907	3.78E-06													
					1813.889	3.94E-06													
					1813.871	3.74E-06													
					1813.854	3.76E-06													
					1813.836	3.77E-06													
					1813.818	3.31E-06													
					1813.8	3.62E-06													
					1813.782	3.6E-06													
					1813.764	3.67E-06													
					1813.746	3.75E-06													
					1813.729	3.57E-06													
					1813.711	3.76E-06													
					1813.693	3.87E-06													
					1813.675	3.96E-06													
					1813.657	3.54E-06													
					1813.639	3.56E-06													
					1813.621	3.6E-06													
					1813.604	3.4E-06													
					1813.586	3.66E-06													
					1813.568	3.76E-06													
					1813.55	3.67E-06													
					1813.53	4.02E-06													
					1813.511	4.22E-06													
					1813.491	4.03E-06													
					1813.472	4.35E-06													
					1813.452	4.22E-06													
					1813.433	4.27E-06													
					1813.413	3.99E-06													
					1813.393	4.14E-06													
					1813.374	4.16E-06													
					1813.354	4.04E-06													
					1813.335	4.19E-06													
					1813.315	4.08E-06													
					1813.296	4.12E-06													
					1813.276	4.25E-06													
					1813.257	3.88E-06													
					1813.237	3.72E-06													
					1813.217	4.33E-06													
					1813.198	4.62E-06													
					1813.178	4.64E-06													
					1813.159	0.000005													
					1813.139	4.94E-06													
					1813.12	4.31E-06													
					1813.1	3.76E-06													
					1813.046	2.75E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1812.991	2.78E-06													
					1812.937	3.48E-06													
					1812.882	3.5E-06													
					1812.828	3.64E-06													
					1812.773	3.16E-06													
					1812.719	3.19E-06													
					1812.664	3.41E-06													
					1812.61	3.11E-06													
					1812.555	3.09E-06													
					1812.526	3.18E-06													
					1812.498	3.95E-06													
					1812.469	3.95E-06													
					1812.441	3.77E-06													
					1812.412	3.92E-06													
					1812.384	3.91E-06													
					1812.355	4.36E-06													
					1812.326	3.93E-06													
					1812.298	3.82E-06													
					1812.269	3.68E-06													
					1812.241	3.66E-06													
					1812.212	3.37E-06													
					1812.184	3.34E-06													
					1812.155	3.35E-06													
					1812.126	3.21E-06													
					1812.098	3.61E-06													
					1812.069	3.64E-06													
					1812.041	3.34E-06													
					1812.012	3.43E-06													
					1811.984	4.31E-06													
					1811.955	3.95E-06													
					1811.926	4.01E-06													
					1811.898	3.77E-06													
					1811.869	4.29E-06													
					1811.841	4.99E-06													
					1811.812	4.28E-06													
					1811.784	3.83E-06													
					1811.755	3.46E-06													
					1811.726	3.54E-06													
					1811.698	3.52E-06													
					1811.669	3.37E-06													
					1811.641	3.39E-06													
					1811.612	3.12E-06													
					1811.584	3.54E-06													
					1811.555	3.7E-06													
					1811.523	3.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1811.49	4.37E-06													
					1811.458	4.39E-06													
					1811.426	0.000004													
					1811.394	3.96E-06													
					1811.361	3.94E-06													
					1811.329	3.96E-06													
					1811.297	4.26E-06													
					1811.265	4.09E-06													
					1811.232	3.86E-06													
					1811.2	3.55E-06													
					1811.168	3.5E-06													
					1811.136	3.3E-06													
					1811.103	3.59E-06													
					1811.071	3.71E-06													
					1811.039	4.17E-06													
					1811.007	4.31E-06													
					1810.974	3.99E-06													
					1810.942	4.79E-06													
					1810.91	5.02E-06													
					1810.878	4.28E-06													
					1810.845	3.32E-06													
					1810.813	3.19E-06													
					1810.781	3.28E-06													
					1810.749	3.59E-06													
					1810.716	3.75E-06													
					1810.684	3.39E-06													
					1810.652	3.49E-06													
					1810.62	3.23E-06													
					1810.587	3.93E-06													
					1810.555	4.19E-06													
					1810.529	3.51E-06													
					1810.504	3.56E-06													
					1810.478	3.57E-06													
					1810.452	3.12E-06													
					1810.427	3.24E-06													
					1810.401	3.79E-06													
					1810.376	4.3E-06													
					1810.35	3.88E-06													
					1810.324	4.43E-06													
					1810.299	3.2E-06													
					1810.273	3.42E-06													
					1810.247	3.6E-06													
					1810.222	3.68E-06													
					1810.196	4.14E-06													
					1810.17	4.08E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1810.145	4.13E-06													
					1810.119	3.8E-06													
					1810.093	3.72E-06													
					1810.068	3.81E-06													
					1810.042	4.03E-06													
					1810.017	4.04E-06													
					1809.991	3.47E-06													
					1809.965	3.43E-06													
					1809.94	3.54E-06													
					1809.914	3.44E-06													
					1809.888	3.32E-06													
					1809.863	3.51E-06													
					1809.837	3.3E-06													
					1809.811	3.45E-06													
					1809.786	3.35E-06													
					1809.76	3.31E-06													
					1809.734	3.15E-06													
					1809.709	3.3E-06													
					1809.683	4.15E-06													
					1809.658	3.8E-06													
					1809.632	3.86E-06													
					1809.606	3.77E-06													
					1809.581	3.49E-06													
					1809.555	3.82E-06													
					1809.532	3.84E-06													
					1809.508	4.24E-06													
					1809.485	3.64E-06													
					1809.462	3.31E-06													
					1809.439	3.42E-06													
					1809.415	3.73E-06													
					1809.392	3.42E-06													
					1809.369	3.17E-06													
					1809.346	3.25E-06													
					1809.322	3.24E-06													
					1809.299	3.39E-06													
					1809.276	3.24E-06													
					1809.253	3.34E-06													
					1809.229	3.23E-06													
					1809.206	3.11E-06													
					1809.183	3.26E-06													
					1809.16	3.43E-06													
					1809.136	3.4E-06													
					1809.113	3.5E-06													
					1809.09	3.56E-06													
					1809.067	3.44E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1809.043	3.52E-06													
					1809.02	3.42E-06													
					1808.997	4.07E-06													
					1808.974	3.63E-06													
					1808.95	3.08E-06													
					1808.927	3.16E-06													
					1808.904	3.22E-06													
					1808.881	3.28E-06													
					1808.857	3.22E-06													
					1808.834	3.32E-06													
					1808.811	3.74E-06													
					1808.788	3.8E-06													
					1808.764	3.44E-06													
					1808.741	3.47E-06													
					1808.718	3.16E-06													
					1808.695	3.78E-06													
					1808.671	3.49E-06													
					1808.648	3.44E-06													
					1808.625	3.57E-06													
					1808.602	3.7E-06													
					1808.578	3.08E-06													
					1808.555	3.16E-06													
					1808.532	3.09E-06													
					1808.51	3.07E-06													
					1808.487	3.02E-06													
					1808.464	3.36E-06													
					1808.441	3.14E-06													
					1808.419	3.17E-06													
					1808.396	3.05E-06													
					1808.373	2.98E-06													
					1808.35	3.24E-06													
					1808.328	3.43E-06													
					1808.305	3.71E-06													
					1808.282	3.02E-06													
					1808.26	3.41E-06													
					1808.237	3.37E-06													
					1808.214	3.38E-06													
					1808.191	3.32E-06													
					1808.169	3.05E-06													
					1808.146	3.14E-06													
					1808.123	2.91E-06													
					1808.1	0.000003													
					1808.078	2.95E-06													
					1808.055	2.97E-06													
					1808.032	3.18E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1808.01	3.26E-06													
					1807.987	3.15E-06													
					1807.964	3.14E-06													
					1807.941	3.21E-06													
					1807.919	0.000003													
					1807.896	3.01E-06													
					1807.873	3.36E-06													
					1807.85	3.19E-06													
					1807.828	3.29E-06													
					1807.805	3.59E-06													
					1807.782	3.66E-06													
					1807.76	3.48E-06													
					1807.737	3.4E-06													
					1807.714	3.64E-06													
					1807.691	3.81E-06													
					1807.669	3.49E-06													
					1807.646	3.27E-06													
					1807.623	3.01E-06													
					1807.6	3.39E-06													
					1807.578	2.87E-06													
					1807.555	3.03E-06													
					1807.534	3.28E-06													
					1807.513	3.94E-06													
					1807.493	3.55E-06													
					1807.472	3.24E-06													
					1807.451	3.37E-06													
					1807.43	3.44E-06													
					1807.409	3.42E-06													
					1807.388	3.53E-06													
					1807.368	3.47E-06													
					1807.347	3.75E-06													
					1807.326	3.58E-06													
					1807.305	3.57E-06													
					1807.284	3.32E-06													
					1807.263	3.63E-06													
					1807.243	3.44E-06													
					1807.222	3.25E-06													
					1807.201	3.29E-06													
					1807.18	3.21E-06													
					1807.159	3.32E-06													
					1807.138	3.5E-06													
					1807.118	3.33E-06													
					1807.097	3.41E-06													
					1807.076	3.04E-06													
					1807.055	3.25E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1807.034	3.39E-06													
					1807.013	4.61E-06													
					1806.993	3.41E-06													
					1806.972	3.29E-06													
					1806.951	4.25E-06													
					1806.93	3.65E-06													
					1806.909	3.92E-06													
					1806.888	4.25E-06													
					1806.868	5.24E-06													
					1806.847	3.94E-06													
					1806.826	3.44E-06													
					1806.805	3.19E-06													
					1806.784	3.15E-06													
					1806.763	3.16E-06													
					1806.743	3.53E-06													
					1806.722	3.33E-06													
					1806.701	3.34E-06													
					1806.68	3.55E-06													
					1806.659	3.49E-06													
					1806.638	3.24E-06													
					1806.618	3.12E-06													
					1806.597	3.15E-06													
					1806.576	3.19E-06													
					1806.555	3.11E-06													
					1806.538	3.13E-06													
					1806.521	3.79E-06													
					1806.504	3.33E-06													
					1806.487	3.53E-06													
					1806.47	3.64E-06													
					1806.453	3.61E-06													
					1806.436	3.91E-06													
					1806.419	3.63E-06													
					1806.402	3.21E-06													
					1806.386	3.49E-06													
					1806.369	3.67E-06													
					1806.352	4.37E-06													
					1806.335	3.91E-06													
					1806.318	4.3E-06													
					1806.301	3.45E-06													
					1806.284	4.32E-06													
					1806.267	4.68E-06													
					1806.25	3.77E-06													
					1806.233	3.88E-06													
					1806.216	3.63E-06													
					1806.199	3.48E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1806.182	3.05E-06													
					1806.165	3.06E-06													
					1806.148	3.22E-06													
					1806.131	3.2E-06													
					1806.114	3.34E-06													
					1806.097	3.36E-06													
					1806.08	3.42E-06													
					1806.063	4.23E-06													
					1806.047	3.72E-06													
					1806.03	3.65E-06													
					1806.013	3.54E-06													
					1805.996	3.6E-06													
					1805.979	3.83E-06													
					1805.962	3.57E-06													
					1805.945	3.61E-06													
					1805.928	4.14E-06													
					1805.911	3.78E-06													
					1805.894	3.6E-06													
					1805.877	3.46E-06													
					1805.86	3.49E-06													
					1805.843	3.83E-06													
					1805.826	4.16E-06													
					1805.809	3.79E-06													
					1805.792	3.89E-06													
					1805.775	3.74E-06													
					1805.758	3.9E-06													
					1805.741	3.77E-06													
					1805.724	3.81E-06													
					1805.708	0.000004													
					1805.691	3.95E-06													
					1805.674	3.51E-06													
					1805.657	3.53E-06													
					1805.64	3.4E-06													
					1805.623	3.67E-06													
					1805.606	4.22E-06													
					1805.589	3.97E-06													
					1805.572	4.13E-06													
					1805.555	4.11E-06													
					1805.535	3.5E-06													
					1805.514	3.5E-06													
					1805.494	3.14E-06													
					1805.473	3.31E-06													
					1805.453	3.87E-06													
					1805.433	3.78E-06													
					1805.412	3.38E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1805.392	3.46E-06													
					1805.371	3.53E-06													
					1805.351	4.16E-06													
					1805.331	4.03E-06													
					1805.31	3.73E-06													
					1805.29	4.14E-06													
					1805.269	3.7E-06													
					1805.249	3.82E-06													
					1805.228	3.72E-06													
					1805.208	3.54E-06													
					1805.188	3.39E-06													
					1805.167	3.38E-06													
					1805.147	3.44E-06													
					1805.126	3.09E-06													
					1805.106	3.09E-06													
					1805.086	3.26E-06													
					1805.065	3.25E-06													
					1805.045	3.36E-06													
					1805.024	3.79E-06													
					1805.004	3.66E-06													
					1804.984	3.52E-06													
					1804.963	3.33E-06													
					1804.943	3.51E-06													
					1804.922	3.35E-06													
					1804.902	3.33E-06													
					1804.882	3.32E-06													
					1804.861	3.26E-06													
					1804.841	3.25E-06													
					1804.82	3.28E-06													
					1804.8	3.79E-06													
					1804.779	3.87E-06													
					1804.759	3.47E-06													
					1804.739	0.000004													
					1804.718	0.000004													
					1804.698	3.67E-06													
					1804.677	3.44E-06													
					1804.657	3.15E-06													
					1804.637	3.38E-06													
					1804.616	3.43E-06													
					1804.596	4.39E-06													
					1804.575	3.73E-06													
					1804.555	3.38E-06													
					1804.534	3.64E-06													
					1804.512	3.97E-06													
					1804.491	3.87E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1804.47	3.64E-06													
					1804.449	3.5E-06													
					1804.427	3.8E-06													
					1804.406	3.83E-06													
					1804.385	4.47E-06													
					1804.364	4.04E-06													
					1804.342	3.96E-06													
					1804.321	3.89E-06													
					1804.3	3.98E-06													
					1804.278	4.22E-06													
					1804.257	3.82E-06													
					1804.236	3.81E-06													
					1804.215	3.68E-06													
					1804.193	3.75E-06													
					1804.172	3.55E-06													
					1804.151	3.72E-06													
					1804.129	4.38E-06													
					1804.108	4.72E-06													
					1804.087	4.29E-06													
					1804.066	4.02E-06													
					1804.044	3.85E-06													
					1804.023	4.12E-06													
					1804.002	4.1E-06													
					1803.981	4.02E-06													
					1803.959	3.97E-06													
					1803.938	3.9E-06													
					1803.917	3.85E-06													
					1803.895	3.84E-06													
					1803.874	3.92E-06													
					1803.853	3.8E-06													
					1803.832	3.46E-06													
					1803.81	3.55E-06													
					1803.789	3.62E-06													
					1803.768	3.48E-06													
					1803.746	3.6E-06													
					1803.725	4.49E-06													
					1803.704	3.46E-06													
					1803.683	3.49E-06													
					1803.661	3.17E-06													
					1803.64	3.4E-06													
					1803.619	3.12E-06													
					1803.598	3.59E-06													
					1803.576	3.71E-06													
					1803.555	3.58E-06													
					1803.532	3.7E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1803.508	3.6E-06													
					1803.485	3.69E-06													
					1803.462	3.74E-06													
					1803.439	3.92E-06													
					1803.415	4.09E-06													
					1803.392	3.87E-06													
					1803.369	4.29E-06													
					1803.346	4.02E-06													
					1803.322	4.04E-06													
					1803.299	4.14E-06													
					1803.276	3.9E-06													
					1803.253	3.9E-06													
					1803.229	3.99E-06													
					1803.206	4.24E-06													
					1803.183	4.01E-06													
					1803.16	4.19E-06													
					1803.136	3.82E-06													
					1803.113	3.43E-06													
					1803.09	3.21E-06													
					1803.067	3.3E-06													
					1803.043	3.79E-06													
					1803.02	3.73E-06													
					1802.997	3.91E-06													
					1802.974	4.09E-06													
					1802.95	3.61E-06													
					1802.927	3.61E-06													
					1802.904	3.75E-06													
					1802.881	0.000004													
					1802.857	3.93E-06													
					1802.834	3.91E-06													
					1802.811	4.05E-06													
					1802.788	3.87E-06													
					1802.764	3.76E-06													
					1802.741	3.94E-06													
					1802.718	3.88E-06													
					1802.695	3.75E-06													
					1802.671	3.98E-06													
					1802.648	4.04E-06													
					1802.625	3.89E-06													
					1802.602	3.85E-06													
					1802.578	4.02E-06													
					1802.555	4.15E-06													
					1802.53	4.7E-06													
					1802.505	4.71E-06													
					1802.48	4.17E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1802.455	3.93E-06													
					1802.43	3.82E-06													
					1802.405	4.03E-06													
					1802.38	3.66E-06													
					1802.355	3.87E-06													
					1802.33	4.56E-06													
					1802.305	4.15E-06													
					1802.28	3.76E-06													
					1802.255	3.79E-06													
					1802.23	4.35E-06													
					1802.205	4.75E-06													
					1802.18	4.66E-06													
					1802.155	4.85E-06													
					1802.13	3.97E-06													
					1802.105	4.12E-06													
					1802.08	3.81E-06													
					1802.055	3.9E-06													
					1802.03	3.68E-06													
					1802.005	3.54E-06													
					1801.98	3.83E-06													
					1801.955	4.04E-06													
					1801.93	4.05E-06													
					1801.905	4.25E-06													
					1801.88	3.82E-06													
					1801.855	3.74E-06													
					1801.83	4.09E-06													
					1801.805	3.93E-06													
					1801.78	4.18E-06													
					1801.755	0.000004													
					1801.73	3.98E-06													
					1801.705	3.74E-06													
					1801.68	3.39E-06													
					1801.655	3.41E-06													
					1801.63	3.78E-06													
					1801.605	3.91E-06													
					1801.58	3.9E-06													
					1801.555	4.21E-06													
					1801.542	3.82E-06													
					1801.528	3.69E-06													
					1801.515	3.74E-06													
					1801.502	3.74E-06													
					1801.488	3.47E-06													
					1801.475	3.6E-06													
					1801.462	3.57E-06													
					1801.448	3.73E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1801.435	3.86E-06													
					1801.422	3.82E-06													
					1801.408	3.7E-06													
					1801.395	5.06E-06													
					1801.382	4.54E-06													
					1801.368	4.96E-06													
					1801.355	5.58E-06													
					1801.342	6.53E-06													
					1801.328	6.37E-06													
					1801.315	5.04E-06													
					1801.302	4.52E-06													
					1801.288	4.18E-06													
					1801.275	3.86E-06													
					1801.262	3.66E-06													
					1801.248	3.58E-06													
					1801.235	3.7E-06													
					1801.222	3.83E-06													
					1801.208	3.93E-06													
					1801.195	3.56E-06													
					1801.182	3.7E-06													
					1801.168	4.01E-06													
					1801.155	3.84E-06													
					1801.142	3.69E-06													
					1801.128	3.74E-06													
					1801.115	3.78E-06													
					1801.102	3.52E-06													
					1801.088	3.74E-06													
					1801.075	3.66E-06													
					1801.062	3.58E-06													
					1801.048	3.42E-06													
					1801.035	3.39E-06													
					1801.022	3.13E-06													
					1801.008	3.31E-06													
					1800.995	3.46E-06													
					1800.982	3.21E-06													
					1800.968	3.23E-06													
					1800.955	3.06E-06													
					1800.942	3.17E-06													
					1800.928	2.94E-06													
					1800.915	0.000004													
					1800.902	3.48E-06													
					1800.888	3.28E-06													
					1800.875	3.56E-06													
					1800.862	4.53E-06													
					1800.848	4.79E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1800.835	3.49E-06													
					1800.822	3.34E-06													
					1800.808	3.26E-06													
					1800.795	3.36E-06													
					1800.782	3.46E-06													
					1800.768	3.58E-06													
					1800.755	3.89E-06													
					1800.742	3.45E-06													
					1800.728	3.42E-06													
					1800.715	3.37E-06													
					1800.702	3.61E-06													
					1800.688	3.62E-06													
					1800.675	3.49E-06													
					1800.662	3.91E-06													
					1800.648	3.42E-06													
					1800.635	3.51E-06													
					1800.622	3.71E-06													
					1800.608	3.39E-06													
					1800.595	3.28E-06													
					1800.582	3.38E-06													
					1800.568	2.99E-06													
					1800.555	3.26E-06													
					1800.531	3.23E-06													
					1800.507	3.23E-06													
					1800.484	3.27E-06													
					1800.46	3.38E-06													
					1800.436	3.29E-06													
					1800.412	3.76E-06													
					1800.388	3.44E-06													
					1800.365	3.28E-06													
					1800.341	3.45E-06													
					1800.317	3.45E-06													
					1800.293	3.18E-06													
					1800.269	3.05E-06													
					1800.245	3.02E-06													
					1800.222	3.21E-06													
					1800.198	3.24E-06													
					1800.174	3.3E-06													
					1800.15	3.48E-06													
					1800.126	3.65E-06													
					1800.103	3.42E-06													
					1800.079	3.55E-06													
					1800.055	3.39E-06													
					1800.031	3.86E-06													
					1800.007	3.58E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1799.984	3.48E-06													
					1799.96	3.62E-06													
					1799.936	3.79E-06													
					1799.912	3.19E-06													
					1799.888	3.45E-06													
					1799.865	3.78E-06													
					1799.841	3.46E-06													
					1799.817	3.32E-06													
					1799.793	3.41E-06													
					1799.769	3.71E-06													
					1799.745	3.46E-06													
					1799.722	3.47E-06													
					1799.698	3.26E-06													
					1799.674	3.18E-06													
					1799.65	3.28E-06													
					1799.626	3.15E-06													
					1799.603	3.6E-06													
					1799.579	3.45E-06													
					1799.555	3.52E-06													
					1799.535	3.33E-06													
					1799.516	3.51E-06													
					1799.496	3.58E-06													
					1799.477	3.22E-06													
					1799.457	3.12E-06													
					1799.437	3.52E-06													
					1799.418	3.48E-06													
					1799.398	3.88E-06													
					1799.379	3.45E-06													
					1799.359	3.14E-06													
					1799.339	3.22E-06													
					1799.32	3.84E-06													
					1799.3	4.86E-06													
					1799.28	4.27E-06													
					1799.261	3.41E-06													
					1799.241	3.34E-06													
					1799.222	3.08E-06													
					1799.202	2.97E-06													
					1799.182	3.08E-06													
					1799.163	3.13E-06													
					1799.143	3.16E-06													
					1799.124	2.96E-06													
					1799.104	2.9E-06													
					1799.084	2.81E-06													
					1799.065	3.27E-06													
					1799.045	3.49E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1799.026	3.58E-06													
					1799.006	3.66E-06													
					1798.986	3.63E-06													
					1798.967	3.78E-06													
					1798.947	3.28E-06													
					1798.928	3.38E-06													
					1798.908	3.47E-06													
					1798.888	3.35E-06													
					1798.869	3.56E-06													
					1798.849	3.87E-06													
					1798.83	3.81E-06													
					1798.81	3.79E-06													
					1798.79	3.77E-06													
					1798.771	3.72E-06													
					1798.751	3.5E-06													
					1798.731	3.67E-06													
					1798.712	3.78E-06													
					1798.692	3.46E-06													
					1798.673	3.33E-06													
					1798.653	3.47E-06													
					1798.633	3.71E-06													
					1798.614	3.49E-06													
					1798.594	3.6E-06													
					1798.575	3.49E-06													
					1798.555	3.46E-06													
					1798.536	3.14E-06													
					1798.518	3.88E-06													
					1798.499	3.5E-06													
					1798.481	3.69E-06													
					1798.462	3.68E-06													
					1798.444	3.69E-06													
					1798.425	4.01E-06													
					1798.407	3.63E-06													
					1798.388	3.4E-06													
					1798.37	3.33E-06													
					1798.351	2.96E-06													
					1798.333	3.16E-06													
					1798.314	3.14E-06													
					1798.296	3.54E-06													
					1798.277	3.81E-06													
					1798.259	3.68E-06													
					1798.24	3.19E-06													
					1798.222	3.17E-06													
					1798.203	3.44E-06													
					1798.185	3.37E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1798.166	3.4E-06													
					1798.148	3.19E-06													
					1798.129	3.24E-06													
					1798.111	3.16E-06													
					1798.092	3.86E-06													
					1798.074	3.53E-06													
					1798.055	3.41E-06													
					1798.036	3.61E-06													
					1798.018	3.57E-06													
					1797.999	3.35E-06													
					1797.981	3.44E-06													
					1797.962	3.5E-06													
					1797.944	3.39E-06													
					1797.925	3.69E-06													
					1797.907	3.7E-06													
					1797.888	3.93E-06													
					1797.87	3.36E-06													
					1797.851	3.39E-06													
					1797.833	3.57E-06													
					1797.814	3.69E-06													
					1797.796	0.000004													
					1797.777	4.24E-06													
					1797.759	4.1E-06													
					1797.74	4.24E-06													
					1797.722	4.01E-06													
					1797.703	3.56E-06													
					1797.685	3.18E-06													
					1797.666	3.27E-06													
					1797.648	3.29E-06													
					1797.629	3.27E-06													
					1797.611	3.24E-06													
					1797.592	3.18E-06													
					1797.574	3.42E-06													
					1797.555	4.22E-06													
					1797.539	3.9E-06													
					1797.522	3.5E-06													
					1797.506	3.62E-06													
					1797.489	3.18E-06													
					1797.473	3.29E-06													
					1797.457	3.24E-06													
					1797.44	3.12E-06													
					1797.424	3.27E-06													
					1797.407	3.09E-06													
					1797.391	3.37E-06													
					1797.375	3.68E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1797.358	3.32E-06													
					1797.342	4.08E-06													
					1797.325	3.76E-06													
					1797.309	3.79E-06													
					1797.293	3.4E-06													
					1797.276	3.35E-06													
					1797.26	3.08E-06													
					1797.244	3.35E-06													
					1797.227	3.79E-06													
					1797.211	3.3E-06													
					1797.194	3.83E-06													
					1797.178	3.65E-06													
					1797.162	3.13E-06													
					1797.145	3.85E-06													
					1797.129	3.47E-06													
					1797.112	3.7E-06													
					1797.096	3.21E-06													
					1797.08	3.46E-06													
					1797.063	3.25E-06													
					1797.047	3.6E-06													
					1797.03	3.64E-06													
					1797.014	3.86E-06													
					1796.998	3.6E-06													
					1796.981	3.72E-06													
					1796.965	3.7E-06													
					1796.948	3.53E-06													
					1796.932	4.09E-06													
					1796.916	3.73E-06													
					1796.899	3.7E-06													
					1796.883	3.84E-06													
					1796.866	4.37E-06													
					1796.85	4.19E-06													
					1796.834	3.84E-06													
					1796.817	3.34E-06													
					1796.801	3.02E-06													
					1796.785	3.08E-06													
					1796.768	3.96E-06													
					1796.752	3.54E-06													
					1796.735	3.59E-06													
					1796.719	4.1E-06													
					1796.703	4.76E-06													
					1796.686	4.65E-06													
					1796.67	4.1E-06													
					1796.653	3.59E-06													
					1796.637	3.9E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1796.621	3.83E-06													
					1796.604	3.53E-06													
					1796.588	3.71E-06													
					1796.571	3.88E-06													
					1796.555	3.87E-06													
					1796.539	3.82E-06													
					1796.522	3.76E-06													
					1796.506	4.01E-06													
					1796.489	3.83E-06													
					1796.473	3.7E-06													
					1796.457	3.5E-06													
					1796.44	3.29E-06													
					1796.424	3.77E-06													
					1796.407	4.41E-06													
					1796.391	4.59E-06													
					1796.375	3.65E-06													
					1796.358	3.69E-06													
					1796.342	5.8E-06													
					1796.325	5.67E-06													
					1796.309	4.8E-06													
					1796.293	4.61E-06													
					1796.276	4.74E-06													
					1796.26	3.95E-06													
					1796.244	3.93E-06													
					1796.227	3.9E-06													
					1796.211	3.3E-06													
					1796.194	3.7E-06													
					1796.178	3.82E-06													
					1796.162	3.37E-06													
					1796.145	3.71E-06													
					1796.129	3.94E-06													
					1796.112	3.97E-06													
					1796.096	4.73E-06													
					1796.08	4.4E-06													
					1796.063	4.08E-06													
					1796.047	4.09E-06													
					1796.03	3.93E-06													
					1796.014	3.76E-06													
					1795.998	4.13E-06													
					1795.981	3.71E-06													
					1795.965	3.3E-06													
					1795.948	3.13E-06													
					1795.932	3.21E-06													
					1795.916	3.41E-06													
					1795.899	3.2E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1795.883	3.12E-06													
					1795.866	2.97E-06													
					1795.85	3.48E-06													
					1795.834	4.1E-06													
					1795.817	3.96E-06													
					1795.801	3.43E-06													
					1795.785	3.39E-06													
					1795.768	3.28E-06													
					1795.752	3.91E-06													
					1795.735	3.63E-06													
					1795.719	3.52E-06													
					1795.703	3.62E-06													
					1795.686	3.72E-06													
					1795.67	3.32E-06													
					1795.653	3.32E-06													
					1795.637	4.02E-06													
					1795.621	3.62E-06													
					1795.604	3.25E-06													
					1795.588	3.45E-06													
					1795.571	3.44E-06													
					1795.555	4.93E-06													
					1795.543	4.84E-06													
					1795.531	4.27E-06													
					1795.519	3.66E-06													
					1795.507	3.92E-06													
					1795.495	4.39E-06													
					1795.483	4.11E-06													
					1795.471	3.03E-06													
					1795.459	2.95E-06													
					1795.447	3.32E-06													
					1795.435	3.28E-06													
					1795.422	4.42E-06													
					1795.41	4.29E-06													
					1795.398	4.82E-06													
					1795.386	4.58E-06													
					1795.374	4.29E-06													
					1795.362	3.84E-06													
					1795.35	3.85E-06													
					1795.338	3.83E-06													
					1795.326	3.94E-06													
					1795.314	3.76E-06													
					1795.302	3.8E-06													
					1795.29	3.93E-06													
					1795.278	3.99E-06													
					1795.266	3.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1795.254	5.92E-06													
					1795.242	4.7E-06													
					1795.23	0.000005													
					1795.218	5.31E-06													
					1795.206	5.1E-06													
					1795.194	5.27E-06													
					1795.182	4.68E-06													
					1795.169	4.33E-06													
					1795.157	3.9E-06													
					1795.145	0.000003													
					1795.133	3.62E-06													
					1795.121	3.35E-06													
					1795.109	3.3E-06													
					1795.097	3.21E-06													
					1795.085	3.43E-06													
					1795.073	3.29E-06													
					1795.061	3.44E-06													
					1795.049	3.03E-06													
					1795.037	3.51E-06													
					1795.025	3.16E-06													
					1795.013	3.01E-06													
					1795.001	3.56E-06													
					1794.989	3.14E-06													
					1794.977	3.85E-06													
					1794.965	3.4E-06													
					1794.953	3.34E-06													
					1794.941	2.82E-06													
					1794.928	3.2E-06													
					1794.916	3.61E-06													
					1794.904	3.43E-06													
					1794.892	3.51E-06													
					1794.88	3.51E-06													
					1794.868	3.36E-06													
					1794.856	3.51E-06													
					1794.844	3.73E-06													
					1794.832	3.42E-06													
					1794.82	3.27E-06													
					1794.808	3.26E-06													
					1794.796	3.5E-06													
					1794.784	3.51E-06													
					1794.772	3.36E-06													
					1794.76	3.53E-06													
					1794.748	3.66E-06													
					1794.736	3.58E-06													
					1794.724	3.65E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1794.712	3.65E-06													
					1794.7	3.34E-06													
					1794.688	3.34E-06													
					1794.675	3.42E-06													
					1794.663	3.49E-06													
					1794.651	3.34E-06													
					1794.639	3.77E-06													
					1794.627	3.72E-06													
					1794.615	3.53E-06													
					1794.603	3.88E-06													
					1794.591	3.79E-06													
					1794.579	3.87E-06													
					1794.567	3.56E-06													
					1794.555	3.33E-06													
					1794.535	3.19E-06													
					1794.515	3.4E-06													
					1794.495	3.85E-06													
					1794.475	3.47E-06													
					1794.455	3.35E-06													
					1794.435	3.84E-06													
					1794.415	3.66E-06													
					1794.395	3.32E-06													
					1794.375	3.43E-06													
					1794.355	3.35E-06													
					1794.335	3.38E-06													
					1794.315	3.27E-06													
					1794.295	3.28E-06													
					1794.275	3.24E-06													
					1794.255	2.97E-06													
					1794.235	2.97E-06													
					1794.215	3.17E-06													
					1794.195	3.13E-06													
					1794.175	3.23E-06													
					1794.155	3.22E-06													
					1794.135	3.48E-06													
					1794.115	3.54E-06													
					1794.095	3.61E-06													
					1794.075	3.56E-06													
					1794.055	3.57E-06													
					1794.035	3.65E-06													
					1794.015	3.6E-06													
					1793.995	3.49E-06													
					1793.975	3.53E-06													
					1793.955	3.58E-06													
					1793.935	3.45E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1793.915	3.45E-06													
					1793.895	3.46E-06													
					1793.875	3.55E-06													
					1793.855	3.52E-06													
					1793.835	3.56E-06													
					1793.815	3.86E-06													
					1793.795	3.5E-06													
					1793.775	3.26E-06													
					1793.755	3.13E-06													
					1793.735	3.44E-06													
					1793.715	3.36E-06													
					1793.695	3.05E-06													
					1793.675	3.13E-06													
					1793.655	3.3E-06													
					1793.635	3.48E-06													
					1793.615	3.78E-06													
					1793.595	3.97E-06													
					1793.575	3.24E-06													
					1793.555	3.19E-06													
					1793.535	3.48E-06													
					1793.514	3.02E-06													
					1793.494	3.32E-06													
					1793.473	3.05E-06													
					1793.453	3.14E-06													
					1793.433	3.05E-06													
					1793.412	3.05E-06													
					1793.392	3.81E-06													
					1793.371	3.54E-06													
					1793.351	3.48E-06													
					1793.331	3.54E-06													
					1793.31	3.64E-06													
					1793.29	0.000004													
					1793.269	4.06E-06													
					1793.249	3.98E-06													
					1793.228	3.73E-06													
					1793.208	3.66E-06													
					1793.188	3.48E-06													
					1793.167	3.69E-06													
					1793.147	3.57E-06													
					1793.126	3.15E-06													
					1793.106	3.32E-06													
					1793.086	3.25E-06													
					1793.065	3.46E-06													
					1793.045	3.55E-06													
					1793.024	3.49E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1793.004	3.76E-06													
					1792.984	3.6E-06													
					1792.963	3.54E-06													
					1792.943	3.83E-06													
					1792.922	4.03E-06													
					1792.902	3.9E-06													
					1792.882	3.66E-06													
					1792.861	3.52E-06													
					1792.841	3.24E-06													
					1792.82	3.34E-06													
					1792.8	3.19E-06													
					1792.779	3.25E-06													
					1792.759	3.29E-06													
					1792.739	3.25E-06													
					1792.718	3.87E-06													
					1792.698	3.68E-06													
					1792.677	3.59E-06													
					1792.657	3.64E-06													
					1792.637	3.4E-06													
					1792.616	3.23E-06													
					1792.596	3.45E-06													
					1792.575	3.26E-06													
					1792.555	3.87E-06													
					1792.531	4.57E-06													
					1792.506	3.82E-06													
					1792.482	3.55E-06													
					1792.457	3.65E-06													
					1792.433	3.6E-06													
					1792.409	3.56E-06													
					1792.384	3.69E-06													
					1792.36	3.86E-06													
					1792.335	3.34E-06													
					1792.311	3.54E-06													
					1792.287	3.54E-06													
					1792.262	4.43E-06													
					1792.238	4.44E-06													
					1792.214	3.82E-06													
					1792.189	3.59E-06													
					1792.165	3.59E-06													
					1792.14	3.33E-06													
					1792.116	3.35E-06													
					1792.092	3.94E-06													
					1792.067	3.78E-06													
					1792.043	3.67E-06													
					1792.018	3.88E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1791.994	3.05E-06													
					1791.97	3.18E-06													
					1791.945	3.38E-06													
					1791.921	3.05E-06													
					1791.896	3.24E-06													
					1791.872	3.36E-06													
					1791.848	3.55E-06													
					1791.823	3.29E-06													
					1791.799	3.38E-06													
					1791.775	3.5E-06													
					1791.75	3.56E-06													
					1791.726	3.42E-06													
					1791.701	2.96E-06													
					1791.677	3.09E-06													
					1791.653	2.86E-06													
					1791.628	3.03E-06													
					1791.604	3.04E-06													
					1791.579	3.59E-06													
					1791.555	3.71E-06													
					1791.531	3.59E-06													
					1791.507	3.5E-06													
					1791.484	3.24E-06													
					1791.46	2.99E-06													
					1791.436	3.38E-06													
					1791.412	3.81E-06													
					1791.388	3.49E-06													
					1791.365	3.74E-06													
					1791.341	3.59E-06													
					1791.317	3.62E-06													
					1791.293	3.83E-06													
					1791.269	4.1E-06													
					1791.245	4.44E-06													
					1791.222	4.7E-06													
					1791.198	4.98E-06													
					1791.174	4.99E-06													
					1791.15	4.58E-06													
					1791.126	4.9E-06													
					1791.103	4.72E-06													
					1791.079	4.5E-06													
					1791.055	4.32E-06													
					1791.031	4.41E-06													
					1791.007	4.48E-06													
					1790.984	4.09E-06													
					1790.96	3.89E-06													
					1790.936	3.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1790.912	3.91E-06													
					1790.888	3.94E-06													
					1790.865	3.97E-06													
					1790.841	3.93E-06													
					1790.817	0.000004													
					1790.793	3.94E-06													
					1790.769	3.85E-06													
					1790.745	4.09E-06													
					1790.722	3.68E-06													
					1790.698	3.84E-06													
					1790.674	3.88E-06													
					1790.65	3.58E-06													
					1790.626	3.82E-06													
					1790.603	3.69E-06													
					1790.579	3.54E-06													
					1790.555	3.98E-06													
					1790.529	3.8E-06													
					1790.504	4.07E-06													
					1790.478	4.17E-06													
					1790.452	3.55E-06													
					1790.427	3.89E-06													
					1790.401	3.73E-06													
					1790.376	3.98E-06													
					1790.35	3.66E-06													
					1790.324	3.71E-06													
					1790.299	3.41E-06													
					1790.273	3.4E-06													
					1790.247	3.58E-06													
					1790.222	3.89E-06													
					1790.196	3.89E-06													
					1790.17	3.85E-06													
					1790.145	3.9E-06													
					1790.119	4.28E-06													
					1790.093	4.28E-06													
					1790.068	3.94E-06													
					1790.042	3.8E-06													
					1790.017	3.94E-06													
					1789.991	3.85E-06													
					1789.965	4.08E-06													
					1789.94	3.59E-06													
					1789.914	3.56E-06													
					1789.888	3.6E-06													
					1789.863	3.63E-06													
					1789.837	3.97E-06													
					1789.811	3.91E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1789.786	3.82E-06													
					1789.76	3.59E-06													
					1789.734	3.58E-06													
					1789.709	3.76E-06													
					1789.683	4.37E-06													
					1789.658	3.91E-06													
					1789.632	3.51E-06													
					1789.606	3.61E-06													
					1789.581	4.1E-06													
					1789.555	4.39E-06													
					1789.533	3.92E-06													
					1789.512	4.17E-06													
					1789.49	3.99E-06													
					1789.468	4.61E-06													
					1789.446	4.64E-06													
					1789.425	4.84E-06													
					1789.403	4.89E-06													
					1789.381	4.53E-06													
					1789.359	4.08E-06													
					1789.338	5.11E-06													
					1789.316	4.84E-06													
					1789.294	5.2E-06													
					1789.272	5.44E-06													
					1789.251	4.79E-06													
					1789.229	5.1E-06													
					1789.207	4.63E-06													
					1789.185	4.65E-06													
					1789.164	4.8E-06													
					1789.142	5.03E-06													
					1789.12	4.95E-06													
					1789.098	3.98E-06													
					1789.077	3.88E-06													
					1789.055	3.85E-06													
					1789.033	3.59E-06													
					1789.012	3.72E-06													
					1788.99	3.6E-06													
					1788.968	3.61E-06													
					1788.946	3.48E-06													
					1788.925	3.64E-06													
					1788.903	3.52E-06													
					1788.881	3.43E-06													
					1788.859	3.59E-06													
					1788.838	3.75E-06													
					1788.816	3.91E-06													
					1788.794	3.8E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1788.772	3.6E-06													
					1788.751	3.51E-06													
					1788.729	3.59E-06													
					1788.707	3.58E-06													
					1788.685	3.52E-06													
					1788.664	3.33E-06													
					1788.642	3.66E-06													
					1788.62	3.94E-06													
					1788.598	4.19E-06													
					1788.577	3.53E-06													
					1788.555	3.54E-06													
					1788.529	3.32E-06													
					1788.502	3.86E-06													
					1788.476	3.91E-06													
					1788.45	3.73E-06													
					1788.423	3.83E-06													
					1788.397	3.8E-06													
					1788.371	3.97E-06													
					1788.344	3.89E-06													
					1788.318	3.68E-06													
					1788.292	3.68E-06													
					1788.266	3.86E-06													
					1788.239	3.73E-06													
					1788.213	3.67E-06													
					1788.187	3.7E-06													
					1788.16	3.87E-06													
					1788.134	3.82E-06													
					1788.108	3.52E-06													
					1788.081	3.92E-06													
					1788.055	3.89E-06													
					1788.029	0.000004													
					1788.002	3.95E-06													
					1787.976	3.81E-06													
					1787.95	3.31E-06													
					1787.923	3.36E-06													
					1787.897	3.34E-06													
					1787.871	3.47E-06													
					1787.844	3.52E-06													
					1787.818	3.63E-06													
					1787.792	3.61E-06													
					1787.766	3.58E-06													
					1787.739	3.68E-06													
					1787.713	3.62E-06													
					1787.687	3.67E-06													
					1787.66	3.63E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1787.634	3.49E-06													
					1787.608	3.33E-06													
					1787.581	3.44E-06													
					1787.555	4.38E-06													
					1787.524	4.34E-06													
					1787.493	4.57E-06													
					1787.461	4.37E-06													
					1787.43	4.12E-06													
					1787.399	3.91E-06													
					1787.368	4.01E-06													
					1787.336	4.81E-06													
					1787.305	5.6E-06													
					1787.274	6.76E-06													
					1787.243	6.33E-06													
					1787.211	4.94E-06													
					1787.18	5.29E-06													
					1787.149	5.66E-06													
					1787.118	3.77E-06													
					1787.086	3.37E-06													
					1787.055	3.18E-06													
					1787.024	3.55E-06													
					1786.993	3.38E-06													
					1786.961	3.6E-06													
					1786.93	3.56E-06													
					1786.899	3.35E-06													
					1786.868	3.73E-06													
					1786.836	3.13E-06													
					1786.805	3.03E-06													
					1786.774	3.1E-06													
					1786.743	3.21E-06													
					1786.711	3.28E-06													
					1786.68	3.43E-06													
					1786.649	3.26E-06													
					1786.618	3.21E-06													
					1786.586	3.56E-06													
					1786.555	3.75E-06													
					1786.531	3.96E-06													
					1786.507	4.02E-06													
					1786.484	3.72E-06													
					1786.46	3.59E-06													
					1786.436	4.34E-06													
					1786.412	4.14E-06													
					1786.388	4.05E-06													
					1786.365	4.4E-06													
					1786.341	3.66E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1786.317	3.42E-06													
					1786.293	3.94E-06													
					1786.269	3.69E-06													
					1786.245	4.66E-06													
					1786.222	3.9E-06													
					1786.198	3.67E-06													
					1786.174	3.89E-06													
					1786.15	3.87E-06													
					1786.126	3.6E-06													
					1786.103	3.94E-06													
					1786.079	3.12E-06													
					1786.055	3.32E-06													
					1786.031	3.06E-06													
					1786.007	3.34E-06													
					1785.984	3.59E-06													
					1785.96	3.79E-06													
					1785.936	3.46E-06													
					1785.912	3.49E-06													
					1785.888	3.69E-06													
					1785.865	3.52E-06													
					1785.841	3.61E-06													
					1785.817	3.8E-06													
					1785.793	3.88E-06													
					1785.769	3.99E-06													
					1785.745	4.2E-06													
					1785.722	4.36E-06													
					1785.698	4.14E-06													
					1785.674	3.96E-06													
					1785.65	3.89E-06													
					1785.626	3.72E-06													
					1785.603	3.77E-06													
					1785.579	3.79E-06													
					1785.555	3.47E-06													
					1785.534	3.57E-06													
					1785.512	3.46E-06													
					1785.491	3.49E-06													
					1785.47	3.37E-06													
					1785.449	3.68E-06													
					1785.427	3.56E-06													
					1785.406	3.4E-06													
					1785.385	3.4E-06													
					1785.364	3.32E-06													
					1785.342	3.48E-06													
					1785.321	3.17E-06													
					1785.3	3.24E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1785.278	3.35E-06													
					1785.257	3.78E-06													
					1785.236	3.76E-06													
					1785.215	3.96E-06													
					1785.193	3.4E-06													
					1785.172	3.47E-06													
					1785.151	3.31E-06													
					1785.129	3.52E-06													
					1785.108	3.64E-06													
					1785.087	3.39E-06													
					1785.066	3.35E-06													
					1785.044	3.32E-06													
					1785.023	3.51E-06													
					1785.002	3.53E-06													
					1784.981	4.03E-06													
					1784.959	3.84E-06													
					1784.938	3.56E-06													
					1784.917	3.4E-06													
					1784.895	3.48E-06													
					1784.874	3.77E-06													
					1784.853	3.76E-06													
					1784.832	3.58E-06													
					1784.81	3.32E-06													
					1784.789	3.24E-06													
					1784.768	3.48E-06													
					1784.746	3.76E-06													
					1784.725	3.86E-06													
					1784.704	4.32E-06													
					1784.683	4.4E-06													
					1784.661	3.52E-06													
					1784.64	3.73E-06													
					1784.619	3.71E-06													
					1784.598	3.65E-06													
					1784.576	3.85E-06													
					1784.555	3.81E-06													
					1784.529	3.69E-06													
					1784.502	4.05E-06													
					1784.476	3.63E-06													
					1784.45	3.21E-06													
					1784.423	3.54E-06													
					1784.397	3.8E-06													
					1784.371	4.48E-06													
					1784.344	4.01E-06													
					1784.318	3.72E-06													
					1784.292	3.57E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1784.266	3.49E-06													
					1784.239	3.45E-06													
					1784.213	3.26E-06													
					1784.187	3.73E-06													
					1784.16	3.64E-06													
					1784.134	3.81E-06													
					1784.108	3.78E-06													
					1784.081	3.89E-06													
					1784.055	3.72E-06													
					1784.029	3.56E-06													
					1784.002	3.29E-06													
					1783.976	3.89E-06													
					1783.95	4.54E-06													
					1783.923	3.93E-06													
					1783.897	4.48E-06													
					1783.871	4.05E-06													
					1783.844	3.61E-06													
					1783.818	3.77E-06													
					1783.792	3.57E-06													
					1783.766	3.36E-06													
					1783.739	3.18E-06													
					1783.713	3.2E-06													
					1783.687	3.01E-06													
					1783.66	2.84E-06													
					1783.634	3.28E-06													
					1783.608	4.03E-06													
					1783.581	4.47E-06													
					1783.555	3.21E-06													
					1783.529	3.89E-06													
					1783.504	3.55E-06													
					1783.478	2.86E-06													
					1783.452	3.37E-06													
					1783.427	3.02E-06													
					1783.401	3.43E-06													
					1783.376	3.63E-06													
					1783.35	3.55E-06													
					1783.324	3.65E-06													
					1783.299	3.8E-06													
					1783.273	3.7E-06													
					1783.247	3.42E-06													
					1783.222	3.6E-06													
					1783.196	3.57E-06													
					1783.17	3.57E-06													
					1783.145	3.91E-06													
					1783.119	4.21E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1783.093	3.64E-06													
					1783.068	4.07E-06													
					1783.042	3.42E-06													
					1783.017	3.19E-06													
					1782.991	3.28E-06													
					1782.965	3.54E-06													
					1782.94	3.95E-06													
					1782.914	3.56E-06													
					1782.888	3.32E-06													
					1782.863	3.29E-06													
					1782.837	3.34E-06													
					1782.811	3.36E-06													
					1782.786	3.56E-06													
					1782.76	3.33E-06													
					1782.734	3.41E-06													
					1782.709	3.16E-06													
					1782.683	3.32E-06													
					1782.658	3.32E-06													
					1782.632	3.29E-06													
					1782.606	3.9E-06													
					1782.581	4.18E-06													
					1782.555	4.83E-06													
					1782.536	0.000005													
					1782.517	4.42E-06													
					1782.497	4.23E-06													
					1782.478	3.39E-06													
					1782.459	3.6E-06													
					1782.44	3.58E-06													
					1782.42	3.87E-06													
					1782.401	4.55E-06													
					1782.382	3.54E-06													
					1782.363	4.04E-06													
					1782.343	3.34E-06													
					1782.324	3.67E-06													
					1782.305	3.83E-06													
					1782.286	3.74E-06													
					1782.267	4.4E-06													
					1782.247	4.18E-06													
					1782.228	4.47E-06													
					1782.209	4.05E-06													
					1782.19	3.74E-06													
					1782.17	3.83E-06													
					1782.151	3.83E-06													
					1782.132	3.5E-06													
					1782.113	3.7E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1782.093	3.82E-06													
					1782.074	3.96E-06													
					1782.055	3.97E-06													
					1782.036	4.12E-06													
					1782.017	3.58E-06													
					1781.997	3.79E-06													
					1781.978	3.54E-06													
					1781.959	4.07E-06													
					1781.94	4.6E-06													
					1781.92	4.26E-06													
					1781.901	4.04E-06													
					1781.882	4.11E-06													
					1781.863	3.95E-06													
					1781.843	3.82E-06													
					1781.824	3.8E-06													
					1781.805	3.76E-06													
					1781.786	3.74E-06													
					1781.767	3.89E-06													
					1781.747	3.48E-06													
					1781.728	4.28E-06													
					1781.709	3.36E-06													
					1781.69	3.46E-06													
					1781.67	4.06E-06													
					1781.651	3.45E-06													
					1781.632	3.71E-06													
					1781.613	3.79E-06													
					1781.593	3.55E-06													
					1781.574	3.69E-06													
					1781.555	3.44E-06													
					1781.525	3.68E-06													
					1781.494	3.49E-06													
					1781.464	3.44E-06													
					1781.434	3.39E-06													
					1781.403	2.9E-06													
					1781.373	3.12E-06													
					1781.343	3.51E-06													
					1781.313	3.17E-06													
					1781.282	3.06E-06													
					1781.252	2.79E-06													
					1781.222	2.75E-06													
					1781.191	2.96E-06													
					1781.161	3.26E-06													
					1781.131	3.06E-06													
					1781.1	3.67E-06													
					1781.07	3.6E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1781.04	4.2E-06													
					1781.01	4.2E-06													
					1780.979	3.73E-06													
					1780.949	3.93E-06													
					1780.919	3.65E-06													
					1780.888	4.1E-06													
					1780.858	4.47E-06													
					1780.828	4.72E-06													
					1780.797	4.14E-06													
					1780.767	3.58E-06													
					1780.737	3.74E-06													
					1780.707	3.97E-06													
					1780.676	3.46E-06													
					1780.646	3.93E-06													
					1780.616	3.87E-06													
					1780.585	4.13E-06													
					1780.555	4.23E-06													
					1780.525	3.64E-06													
					1780.494	0.000004													
					1780.464	3.81E-06													
					1780.434	3.39E-06													
					1780.403	3.23E-06													
					1780.373	3.52E-06													
					1780.343	3.6E-06													
					1780.313	4.22E-06													
					1780.282	4.97E-06													
					1780.252	3.94E-06													
					1780.222	4.12E-06													
					1780.191	3.32E-06													
					1780.161	3.2E-06													
					1780.131	3.23E-06													
					1780.1	3.11E-06													
					1780.07	3.77E-06													
					1780.04	3.31E-06													
					1780.01	3.3E-06													
					1779.979	3.74E-06													
					1779.949	3.63E-06													
					1779.919	3.58E-06													
					1779.888	3.42E-06													
					1779.858	3.53E-06													
					1779.828	3.46E-06													
					1779.797	3.65E-06													
					1779.767	3.73E-06													
					1779.737	3.55E-06													
					1779.707	3.54E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1779.676	3.79E-06													
					1779.646	3.68E-06													
					1779.616	4.07E-06													
					1779.585	4.63E-06													
					1779.555	4.04E-06													
					1779.527	3.86E-06													
					1779.499	3.95E-06													
					1779.472	4.18E-06													
					1779.444	4.45E-06													
					1779.416	4.5E-06													
					1779.388	4.71E-06													
					1779.361	5.13E-06													
					1779.333	4.89E-06													
					1779.305	4.59E-06													
					1779.277	4.2E-06													
					1779.249	3.99E-06													
					1779.222	3.85E-06													
					1779.194	3.68E-06													
					1779.166	3.55E-06													
					1779.138	3.39E-06													
					1779.111	3.39E-06													
					1779.083	3.44E-06													
					1779.055	3.61E-06													
					1779.027	3.84E-06													
					1778.999	3.84E-06													
					1778.972	3.51E-06													
					1778.944	3.42E-06													
					1778.916	3.62E-06													
					1778.888	3.7E-06													
					1778.861	3.82E-06													
					1778.833	3.88E-06													
					1778.805	3.93E-06													
					1778.777	3.87E-06													
					1778.749	3.63E-06													
					1778.722	3.48E-06													
					1778.694	3.53E-06													
					1778.666	3.73E-06													
					1778.638	3.46E-06													
					1778.611	3.32E-06													
					1778.583	3.22E-06													
					1778.555	3.24E-06													
					1778.531	3.4E-06													
					1778.506	3.26E-06													
					1778.482	3.3E-06													
					1778.457	3.44E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1778.433	3.4E-06													
					1778.409	3.53E-06													
					1778.384	3.73E-06													
					1778.36	3.96E-06													
					1778.335	4.66E-06													
					1778.311	4.25E-06													
					1778.287	3.08E-06													
					1778.262	3.08E-06													
					1778.238	2.89E-06													
					1778.214	3.17E-06													
					1778.189	3.49E-06													
					1778.165	3.51E-06													
					1778.14	3.12E-06													
					1778.116	3.1E-06													
					1778.092	3.22E-06													
					1778.067	3.2E-06													
					1778.043	3.06E-06													
					1778.018	3.71E-06													
					1777.994	3.69E-06													
					1777.97	3.57E-06													
					1777.945	3.84E-06													
					1777.921	4.13E-06													
					1777.896	3.34E-06													
					1777.872	3.69E-06													
					1777.848	3.68E-06													
					1777.823	3.6E-06													
					1777.799	3.6E-06													
					1777.775	3.69E-06													
					1777.75	3.45E-06													
					1777.726	3.31E-06													
					1777.701	3.24E-06													
					1777.677	3.14E-06													
					1777.653	3.31E-06													
					1777.628	3.65E-06													
					1777.604	3.48E-06													
					1777.579	3.48E-06													
					1777.555	3.67E-06													
					1777.527	3.46E-06													
					1777.499	3.42E-06													
					1777.472	3.55E-06													
					1777.444	3.42E-06													
					1777.416	3.25E-06													
					1777.388	3.5E-06													
					1777.361	3.59E-06													
					1777.333	3.63E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1777.305	3.37E-06													
					1777.277	3.27E-06													
					1777.249	3.48E-06													
					1777.222	3.2E-06													
					1777.194	3.28E-06													
					1777.166	3.11E-06													
					1777.138	3.6E-06													
					1777.111	4.02E-06													
					1777.083	3.57E-06													
					1777.055	3.13E-06													
					1777.027	3.2E-06													
					1776.999	3.31E-06													
					1776.972	3.03E-06													
					1776.944	3.24E-06													
					1776.916	3.62E-06													
					1776.888	3.75E-06													
					1776.861	3.55E-06													
					1776.833	3.4E-06													
					1776.805	3.29E-06													
					1776.777	3.18E-06													
					1776.749	3.14E-06													
					1776.722	2.93E-06													
					1776.694	2.95E-06													
					1776.666	2.79E-06													
					1776.638	2.94E-06													
					1776.611	3.25E-06													
					1776.583	3.03E-06													
					1776.555	3.08E-06													
					1776.533	3.26E-06													
					1776.511	3.34E-06													
					1776.488	4.1E-06													
					1776.466	3.78E-06													
					1776.444	4.14E-06													
					1776.422	3.88E-06													
					1776.399	3.96E-06													
					1776.377	3.63E-06													
					1776.355	3.36E-06													
					1776.333	3.69E-06													
					1776.311	4.73E-06													
					1776.288	3.94E-06													
					1776.266	3.68E-06													
					1776.244	3.51E-06													
					1776.222	3.31E-06													
					1776.199	3.22E-06													
					1776.177	3.33E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1776.155	3.28E-06													
					1776.133	0.000003													
					1776.111	3.13E-06													
					1776.088	3.49E-06													
					1776.066	3.4E-06													
					1776.044	3.26E-06													
					1776.022	3.34E-06													
					1775.999	3.27E-06													
					1775.977	3.21E-06													
					1775.955	3.16E-06													
					1775.933	3.08E-06													
					1775.911	3.3E-06													
					1775.888	3.52E-06													
					1775.866	3.76E-06													
					1775.844	3.35E-06													
					1775.822	3.62E-06													
					1775.799	3.53E-06													
					1775.777	3.4E-06													
					1775.755	3.5E-06													
					1775.733	3.53E-06													
					1775.711	3.77E-06													
					1775.688	3.61E-06													
					1775.666	3.26E-06													
					1775.644	3.47E-06													
					1775.622	3.67E-06													
					1775.599	3.45E-06													
					1775.577	3.58E-06													
					1775.555	3.87E-06													
					1775.536	3.35E-06													
					1775.518	3.19E-06													
					1775.499	3.24E-06													
					1775.481	3.28E-06													
					1775.462	2.95E-06													
					1775.444	3.13E-06													
					1775.425	3.53E-06													
					1775.407	3.17E-06													
					1775.388	3.32E-06													
					1775.37	3.55E-06													
					1775.351	3.53E-06													
					1775.333	2.88E-06													
					1775.314	2.84E-06													
					1775.296	2.96E-06													
					1775.277	3.03E-06													
					1775.259	2.75E-06													
					1775.24	2.91E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003		Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1775.222	2.91E-06													
					1775.203	3.18E-06													
					1775.185	3.09E-06													
					1775.166	3.02E-06													
					1775.148	3.18E-06													
					1775.129	3.09E-06													
					1775.111	3.29E-06													
					1775.092	3.19E-06													
					1775.074	3.54E-06													
					1775.055	3.37E-06													
					1775.036	3.1E-06													
					1775.018	3.18E-06													
					1774.999	3.16E-06													
					1774.981	3.43E-06													
					1774.962	3.24E-06													
					1774.944	3.14E-06													
					1774.925	3.21E-06													
					1774.907	3.29E-06													
					1774.888	3.4E-06													
					1774.87	3.41E-06													
					1774.851	3.16E-06													
					1774.833	3.35E-06													
					1774.814	3.48E-06													
					1774.796	3.39E-06													
					1774.777	3.35E-06													
					1774.759	3.42E-06													
					1774.74	3.73E-06													
					1774.722	3.35E-06													
					1774.703	3.69E-06													
					1774.685	3.14E-06													
					1774.666	3.37E-06													
					1774.648	3.58E-06													
					1774.629	3.55E-06													
					1774.611	3.63E-06													
					1774.592	3.36E-06													
					1774.574	3.17E-06													
					1774.555	3.55E-06													
					1774.535	3.51E-06													
					1774.515	3.85E-06													
					1774.495	4.09E-06													
					1774.475	3.64E-06													
					1774.455	3.16E-06													
					1774.435	3.06E-06													
					1774.415	3.21E-06													
					1774.395	3.5E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1774.375	3.22E-06													
					1774.355	3.36E-06													
					1774.335	3.55E-06													
					1774.315	3.65E-06													
					1774.295	3.61E-06													
					1774.275	3.56E-06													
					1774.255	3.54E-06													
					1774.235	3.49E-06													
					1774.215	3.44E-06													
					1774.195	3.76E-06													
					1774.175	3.31E-06													
					1774.155	3.28E-06													
					1774.135	3.68E-06													
					1774.115	3.75E-06													
					1774.095	3.59E-06													
					1774.075	3.7E-06													
					1774.055	3.33E-06													
					1774.035	3.26E-06													
					1774.015	3.17E-06													
					1773.995	3.13E-06													
					1773.975	2.99E-06													
					1773.955	2.79E-06													
					1773.935	3.02E-06													
					1773.915	3.34E-06													
					1773.895	3.76E-06													
					1773.875	3.52E-06													
					1773.855	3.39E-06													
					1773.835	3.43E-06													
					1773.815	3.21E-06													
					1773.795	3.39E-06													
					1773.775	3.46E-06													
					1773.755	3.6E-06													
					1773.735	3.58E-06													
					1773.715	3.39E-06													
					1773.695	3.68E-06													
					1773.675	3.37E-06													
					1773.655	3.22E-06													
					1773.635	3.33E-06													
					1773.615	3.69E-06													
					1773.595	3.52E-06													
					1773.575	3.66E-06													
					1773.555	3.84E-06													
					1773.541	3.31E-06													
					1773.528	3.12E-06													
					1773.514	3.57E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1773.501	3.65E-06													
					1773.487	3.6E-06													
					1773.474	3.25E-06													
					1773.46	3.41E-06													
					1773.447	3.24E-06													
					1773.433	3.33E-06													
					1773.42	3.4E-06													
					1773.406	3.78E-06													
					1773.393	3.91E-06													
					1773.379	4.47E-06													
					1773.366	4.65E-06													
					1773.352	4.29E-06													
					1773.339	4.01E-06													
					1773.325	3.83E-06													
					1773.312	3.77E-06													
					1773.298	3.37E-06													
					1773.285	4.12E-06													
					1773.271	4.49E-06													
					1773.258	4.46E-06													
					1773.244	3.82E-06													
					1773.231	3.86E-06													
					1773.217	3.9E-06													
					1773.204	4.19E-06													
					1773.19	4.1E-06													
					1773.177	3.67E-06													
					1773.163	3.04E-06													
					1773.15	3.36E-06													
					1773.136	3.37E-06													
					1773.123	3.45E-06													
					1773.109	3.86E-06													
					1773.096	3.39E-06													
					1773.082	3.52E-06													
					1773.069	3.53E-06													
					1773.055	3.34E-06													
					1773.041	3.73E-06													
					1773.028	3.67E-06													
					1773.014	3.73E-06													
					1773.001	3.58E-06													
					1772.987	3.72E-06													
					1772.974	3.52E-06													
					1772.96	3.67E-06													
					1772.947	3.45E-06													
					1772.933	3.43E-06													
					1772.92	3.52E-06													
					1772.906	3.37E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1772.893	3.2E-06													
					1772.879	3.25E-06													
					1772.866	3.06E-06													
					1772.852	3.09E-06													
					1772.839	3.2E-06													
					1772.825	3.83E-06													
					1772.812	4.22E-06													
					1772.798	3.72E-06													
					1772.785	3.65E-06													
					1772.771	3.55E-06													
					1772.758	3.5E-06													
					1772.744	3.81E-06													
					1772.731	4.04E-06													
					1772.717	3.79E-06													
					1772.704	3.11E-06													
					1772.69	3.12E-06													
					1772.677	3.38E-06													
					1772.663	3.68E-06													
					1772.65	3.69E-06													
					1772.636	3.86E-06													
					1772.623	4.22E-06													
					1772.609	3.3E-06													
					1772.596	3.44E-06													
					1772.582	3.48E-06													
					1772.569	3.32E-06													
					1772.555	3.39E-06													
					1772.541	3.78E-06													
					1772.527	3.79E-06													
					1772.513	3.53E-06													
					1772.499	3.81E-06													
					1772.486	3.58E-06													
					1772.472	3.6E-06													
					1772.458	3.72E-06													
					1772.444	3.5E-06													
					1772.43	3.43E-06													
					1772.416	3.18E-06													
					1772.402	3.56E-06													
					1772.388	3.81E-06													
					1772.374	3.61E-06													
					1772.361	3.79E-06													
					1772.347	3.38E-06													
					1772.333	3.17E-06													
					1772.319	3.23E-06													
					1772.305	3.96E-06													
					1772.291	0.000004													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1772.277	4.57E-06													
					1772.263	3.96E-06													
					1772.249	3.7E-06													
					1772.236	3.78E-06													
					1772.222	3.83E-06													
					1772.208	3.67E-06													
					1772.194	3.12E-06													
					1772.18	3.1E-06													
					1772.166	3.06E-06													
					1772.152	3.35E-06													
					1772.138	3.45E-06													
					1772.124	3.47E-06													
					1772.111	3.12E-06													
					1772.097	3.21E-06													
					1772.083	3.54E-06													
					1772.069	3.71E-06													
					1772.055	4.23E-06													
					1772.041	4.29E-06													
					1772.027	3.48E-06													
					1772.013	3.41E-06													
					1771.999	3.44E-06													
					1771.986	3.73E-06													
					1771.972	3.48E-06													
					1771.958	3.39E-06													
					1771.944	3.35E-06													
					1771.93	3.66E-06													
					1771.916	3.56E-06													
					1771.902	3.58E-06													
					1771.888	3.41E-06													
					1771.874	3.17E-06													
					1771.861	3.28E-06													
					1771.847	3.45E-06													
					1771.833	3.8E-06													
					1771.819	3.89E-06													
					1771.805	3.45E-06													
					1771.791	3.01E-06													
					1771.777	3.22E-06													
					1771.763	3.38E-06													
					1771.749	3.01E-06													
					1771.736	3.04E-06													
					1771.722	3.83E-06													
					1771.708	3.92E-06													
					1771.694	4.27E-06													
					1771.68	4.76E-06													
					1771.666	4.09E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1771.652	3.92E-06													
					1771.638	3.54E-06													
					1771.624	3.64E-06													
					1771.611	3.34E-06													
					1771.597	3.39E-06													
					1771.583	3.4E-06													
					1771.569	3.63E-06													
					1771.555	3.35E-06													
					1771.542	4.05E-06													
					1771.529	5.57E-06													
					1771.516	4.79E-06													
					1771.502	4.79E-06													
					1771.489	4.42E-06													
					1771.476	3.58E-06													
					1771.463	0.000003													
					1771.45	3.5E-06													
					1771.437	3.56E-06													
					1771.423	4.03E-06													
					1771.41	4.91E-06													
					1771.397	4.04E-06													
					1771.384	4.13E-06													
					1771.371	3.95E-06													
					1771.358	3.6E-06													
					1771.344	3.57E-06													
					1771.331	3.99E-06													
					1771.318	4.04E-06													
					1771.305	4.19E-06													
					1771.292	0.000004													
					1771.279	3.9E-06													
					1771.266	3.63E-06													
					1771.252	4.03E-06													
					1771.239	3.62E-06													
					1771.226	3.84E-06													
					1771.213	3.98E-06													
					1771.2	3.93E-06													
					1771.187	4.36E-06													
					1771.173	3.34E-06													
					1771.16	3.61E-06													
					1771.147	3.8E-06													
					1771.134	3.53E-06													
					1771.121	3.74E-06													
					1771.108	4.01E-06													
					1771.094	3.23E-06													
					1771.081	3.36E-06													
					1771.068	3.7E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1771.055	3.61E-06													
					1771.042	3.91E-06													
					1771.029	3.99E-06													
					1771.016	3.82E-06													
					1771.002	3.61E-06													
					1770.989	3.57E-06													
					1770.976	3.89E-06													
					1770.963	4.25E-06													
					1770.95	4.34E-06													
					1770.937	3.42E-06													
					1770.923	3.55E-06													
					1770.91	3.14E-06													
					1770.897	3.66E-06													
					1770.884	3.83E-06													
					1770.871	3.48E-06													
					1770.858	3.4E-06													
					1770.844	3.46E-06													
					1770.831	3.89E-06													
					1770.818	3.86E-06													
					1770.805	3.64E-06													
					1770.792	3.86E-06													
					1770.779	4.53E-06													
					1770.766	4.36E-06													
					1770.752	3.85E-06													
					1770.739	3.93E-06													
					1770.726	3.6E-06													
					1770.713	3.35E-06													
					1770.7	3.25E-06													
					1770.687	3.3E-06													
					1770.673	3.42E-06													
					1770.66	3.79E-06													
					1770.647	3.83E-06													
					1770.634	3.82E-06													
					1770.621	3.96E-06													
					1770.608	3.97E-06													
					1770.594	0.000004													
					1770.581	4.14E-06													
					1770.568	4.25E-06													
					1770.555	3.88E-06													
					1770.539	3.39E-06													
					1770.524	3.92E-06													
					1770.508	4.03E-06													
					1770.493	4.1E-06													
					1770.477	3.88E-06													
					1770.461	3.77E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1770.446	3.69E-06													
					1770.43	3.89E-06													
					1770.414	3.76E-06													
					1770.399	3.59E-06													
					1770.383	3.45E-06													
					1770.368	3.76E-06													
					1770.352	3.98E-06													
					1770.336	4.68E-06													
					1770.321	4.23E-06													
					1770.305	3.9E-06													
					1770.289	3.75E-06													
					1770.274	3.8E-06													
					1770.258	3.75E-06													
					1770.243	3.63E-06													
					1770.227	4.04E-06													
					1770.211	4.07E-06													
					1770.196	3.48E-06													
					1770.18	3.55E-06													
					1770.164	3.58E-06													
					1770.149	3.62E-06													
					1770.133	3.55E-06													
					1770.118	4.15E-06													
					1770.102	4.32E-06													
					1770.086	4.65E-06													
					1770.071	4.96E-06													
					1770.055	4.56E-06													
					1770.039	4.67E-06													
					1770.024	4.12E-06													
					1770.008	4.1E-06													
					1769.993	4.07E-06													
					1769.977	4.04E-06													
					1769.961	4.51E-06													
					1769.946	4.55E-06													
					1769.93	4.58E-06													
					1769.914	4.52E-06													
					1769.899	3.51E-06													
					1769.883	3.46E-06													
					1769.868	3.51E-06													
					1769.852	3.66E-06													
					1769.836	3.33E-06													
					1769.821	3.06E-06													
					1769.805	3.12E-06													
					1769.789	2.96E-06													
					1769.774	2.76E-06													
					1769.758	3.11E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1769.743	3.48E-06													
					1769.727	3.65E-06													
					1769.711	4.04E-06													
					1769.696	3.32E-06													
					1769.68	3.01E-06													
					1769.664	3.11E-06													
					1769.649	3.59E-06													
					1769.633	3.93E-06													
					1769.618	3.36E-06													
					1769.602	2.88E-06													
					1769.586	3.06E-06													
					1769.571	3.4E-06													
					1769.555	3.69E-06													
					1769.532	3.91E-06													
					1769.51	4.18E-06													
					1769.487	3.35E-06													
					1769.464	3.65E-06													
					1769.441	3.42E-06													
					1769.419	3.35E-06													
					1769.396	3.64E-06													
					1769.373	3.21E-06													
					1769.35	4.26E-06													
					1769.328	4.79E-06													
					1769.305	5.68E-06													
					1769.282	5.43E-06													
					1769.26	4.42E-06													
					1769.237	4.77E-06													
					1769.214	4.71E-06													
					1769.191	4.25E-06													
					1769.169	3.83E-06													
					1769.146	3.76E-06													
					1769.123	4.07E-06													
					1769.1	3.99E-06													
					1769.078	3.59E-06													
					1769.055	3.55E-06													
					1769.032	3.66E-06													
					1769.01	3.71E-06													
					1768.987	3.74E-06													
					1768.964	3.6E-06													
					1768.941	3.87E-06													
					1768.919	4.24E-06													
					1768.896	4.36E-06													
					1768.873	3.91E-06													
					1768.85	3.91E-06													
					1768.828	3.9E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1768.805	3.82E-06													
					1768.782	3.35E-06													
					1768.76	3.91E-06													
					1768.737	3.67E-06													
					1768.714	3.75E-06													
					1768.691	3.42E-06													
					1768.669	3.89E-06													
					1768.646	4.07E-06													
					1768.623	3.84E-06													
					1768.6	3.81E-06													
					1768.578	3.53E-06													
					1768.555	3.66E-06													
					1768.517	3.34E-06													
					1768.478	3.37E-06													
					1768.44	4.39E-06													
					1768.401	4.52E-06													
					1768.363	4.89E-06													
					1768.324	4.4E-06													
					1768.286	3.37E-06													
					1768.247	3.57E-06													
					1768.209	3.44E-06													
					1768.17	3.24E-06													
					1768.132	3.35E-06													
					1768.093	4.04E-06													
					1768.055	3.85E-06													
					1768.017	3.65E-06													
					1767.978	4.23E-06													
					1767.94	3.67E-06													
					1767.901	4.01E-06													
					1767.863	3.66E-06													
					1767.824	3.77E-06													
					1767.786	3.61E-06													
					1767.747	3.77E-06													
					1767.709	3.37E-06													
					1767.67	3.7E-06													
					1767.632	3.73E-06													
					1767.593	3.32E-06													
					1767.555	3.73E-06													
					1767.537	4.32E-06													
					1767.519	3.68E-06													
					1767.501	3.45E-06													
					1767.484	3.87E-06													
					1767.466	3.65E-06													
					1767.448	3.67E-06													
					1767.43	3.46E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al, 1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1767.412	3.34E-06													
					1767.394	3.45E-06													
					1767.376	3.17E-06													
					1767.359	3.61E-06													
					1767.341	3.83E-06													
					1767.323	3.69E-06													
					1767.305	3.24E-06													
					1767.287	3.38E-06													
					1767.269	3.56E-06													
					1767.251	3.77E-06													
					1767.234	3.26E-06													
					1767.216	3.56E-06													
					1767.198	3.42E-06													
					1767.18	3.3E-06													
					1767.162	3.63E-06													
					1767.144	3.54E-06													
					1767.126	3.37E-06													
					1767.109	3.48E-06													
					1767.091	3.57E-06													
					1767.073	3.15E-06													
					1767.055	3.63E-06													
					1767.037	3.96E-06													
					1767.019	3.95E-06													
					1767.001	3.94E-06													
					1766.984	3.54E-06													
					1766.966	3.35E-06													
					1766.948	3.51E-06													
					1766.93	3.61E-06													
					1766.912	3.56E-06													
					1766.894	3.85E-06													
					1766.876	3.61E-06													
					1766.859	3.29E-06													
					1766.841	3.58E-06													
					1766.823	3.44E-06													
					1766.805	3.41E-06													
					1766.787	3.48E-06													
					1766.769	3.39E-06													
					1766.751	3.66E-06													
					1766.734	3.58E-06													
					1766.716	3.64E-06													
					1766.698	3.82E-06													
					1766.68	3.74E-06													
					1766.662	3.84E-06													
					1766.644	4.95E-06													
					1766.626	4.41E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1766.609	4.36E-06													
					1766.591	4.15E-06													
					1766.573	4.25E-06													
					1766.555	4.16E-06													
					1766.536	4.64E-06													
					1766.517	3.9E-06													
					1766.497	3.41E-06													
					1766.478	3.81E-06													
					1766.459	3.87E-06													
					1766.44	3.88E-06													
					1766.42	3.77E-06													
					1766.401	3.46E-06													
					1766.382	3.88E-06													
					1766.363	3.72E-06													
					1766.343	3.92E-06													
					1766.324	3.83E-06													
					1766.305	3.99E-06													
					1766.286	3.92E-06													
					1766.267	3.96E-06													
					1766.247	3.75E-06													
					1766.228	3.63E-06													
					1766.209	3.61E-06													
					1766.19	3.5E-06													
					1766.17	3.67E-06													
					1766.151	3.54E-06													
					1766.132	3.4E-06													
					1766.113	3.12E-06													
					1766.093	3.13E-06													
					1766.074	3.13E-06													
					1766.055	3.41E-06													
					1766.036	3.74E-06													
					1766.017	3.63E-06													
					1765.997	3.49E-06													
					1765.978	4.1E-06													
					1765.959	4.06E-06													
					1765.94	3.94E-06													
					1765.92	4.15E-06													
					1765.901	3.95E-06													
					1765.882	4.09E-06													
					1765.863	4.14E-06													
					1765.843	4.28E-06													
					1765.824	3.91E-06													
					1765.805	3.95E-06													
					1765.786	4.14E-06													
					1765.767	3.87E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1765.747	4.08E-06													
					1765.728	3.65E-06													
					1765.709	3.99E-06													
					1765.69	4.83E-06													
					1765.67	4.02E-06													
					1765.651	3.94E-06													
					1765.632	0.000004													
					1765.613	4.46E-06													
					1765.593	3.97E-06													
					1765.574	3.89E-06													
					1765.555	3.64E-06													
					1765.54	3.67E-06													
					1765.525	4.28E-06													
					1765.51	4.06E-06													
					1765.495	4.28E-06													
					1765.48	4.38E-06													
					1765.465	4.56E-06													
					1765.451	4.38E-06													
					1765.436	4.31E-06													
					1765.421	4.67E-06													
					1765.406	5.14E-06													
					1765.391	4.98E-06													
					1765.376	4.22E-06													
					1765.361	4.82E-06													
					1765.346	4.33E-06													
					1765.331	4.27E-06													
					1765.316	4.48E-06													
					1765.301	7.62E-06													
					1765.286	6.91E-06													
					1765.271	6.51E-06													
					1765.256	6.04E-06													
					1765.242	4.6E-06													
					1765.227	4.88E-06													
					1765.212	4.8E-06													
					1765.197	4.67E-06													
					1765.182	4.52E-06													
					1765.167	4.79E-06													
					1765.152	4.59E-06													
					1765.137	4.21E-06													
					1765.122	4.17E-06													
					1765.107	4.95E-06													
					1765.092	4.77E-06													
					1765.077	4.4E-06													
					1765.062	3.66E-06													
					1765.048	3.85E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1765.033	4.26E-06													
					1765.018	4.29E-06													
					1765.003	3.9E-06													
					1764.988	3.69E-06													
					1764.973	3.93E-06													
					1764.958	3.74E-06													
					1764.943	3.89E-06													
					1764.928	3.99E-06													
					1764.913	3.76E-06													
					1764.898	3.27E-06													
					1764.883	3.45E-06													
					1764.868	3.81E-06													
					1764.854	3.66E-06													
					1764.839	3.84E-06													
					1764.824	3.84E-06													
					1764.809	3.86E-06													
					1764.794	3.75E-06													
					1764.779	3.94E-06													
					1764.764	4.06E-06													
					1764.749	3.94E-06													
					1764.734	3.93E-06													
					1764.719	3.62E-06													
					1764.704	3.95E-06													
					1764.689	3.95E-06													
					1764.674	3.8E-06													
					1764.659	3.81E-06													
					1764.645	3.47E-06													
					1764.63	3.52E-06													
					1764.615	3.47E-06													
					1764.6	3.52E-06													
					1764.585	4.05E-06													
					1764.57	4.29E-06													
					1764.555	3.98E-06													
					1764.528	3.88E-06													
					1764.501	3.89E-06													
					1764.474	4.83E-06													
					1764.447	4.31E-06													
					1764.42	4.43E-06													
					1764.393	4.18E-06													
					1764.366	4.26E-06													
					1764.339	4.85E-06													
					1764.312	5.04E-06													
					1764.285	4.41E-06													
					1764.258	4.67E-06													
					1764.231	4.12E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1764.204	4.08E-06													
					1764.177	3.85E-06													
					1764.15	3.91E-06													
					1764.123	4.06E-06													
					1764.096	3.88E-06													
					1764.069	3.89E-06													
					1764.041	3.67E-06													
					1764.014	4.17E-06													
					1763.987	4.03E-06													
					1763.96	3.9E-06													
					1763.933	3.97E-06													
					1763.906	3.66E-06													
					1763.879	3.43E-06													
					1763.852	3.27E-06													
					1763.825	3.29E-06													
					1763.798	3.06E-06													
					1763.771	3.26E-06													
					1763.744	3.68E-06													
					1763.717	3.96E-06													
					1763.69	4.04E-06													
					1763.663	4.15E-06													
					1763.636	4.28E-06													
					1763.609	4.27E-06													
					1763.582	4.17E-06													
					1763.555	3.84E-06													
					1763.536	3.76E-06													
					1763.517	4.14E-06													
					1763.498	4.09E-06													
					1763.48	3.74E-06													
					1763.461	4.39E-06													
					1763.442	4.44E-06													
					1763.423	4.11E-06													
					1763.404	3.63E-06													
					1763.385	4.3E-06													
					1763.366	4.36E-06													
					1763.347	4.92E-06													
					1763.329	5.61E-06													
					1763.31	5.03E-06													
					1763.291	4.9E-06													
					1763.272	3.81E-06													
					1763.253	3.81E-06													
					1763.234	3.58E-06													
					1763.215	3.45E-06													
					1763.197	3.31E-06													
					1763.178	3.53E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1763.159	3.54E-06													
					1763.14	3.49E-06													
					1763.121	3.75E-06													
					1763.102	3.66E-06													
					1763.083	3.56E-06													
					1763.064	3.68E-06													
					1763.046	3.37E-06													
					1763.027	3.3E-06													
					1763.008	3.64E-06													
					1762.989	3.87E-06													
					1762.97	3.44E-06													
					1762.951	3.73E-06													
					1762.932	3.95E-06													
					1762.913	3.67E-06													
					1762.895	3.65E-06													
					1762.876	3.73E-06													
					1762.857	3.62E-06													
					1762.838	3.29E-06													
					1762.819	3.35E-06													
					1762.8	4.2E-06													
					1762.781	3.74E-06													
					1762.763	3.52E-06													
					1762.744	3.47E-06													
					1762.725	4.05E-06													
					1762.706	3.66E-06													
					1762.687	3.71E-06													
					1762.668	3.56E-06													
					1762.649	3.88E-06													
					1762.63	3.88E-06													
					1762.612	3.67E-06													
					1762.593	4.17E-06													
					1762.574	3.91E-06													
					1762.555	3.93E-06													
					1762.522	4.3E-06													
					1762.488	4.03E-06													
					1762.455	4.5E-06													
					1762.422	3.85E-06													
					1762.388	3.63E-06													
					1762.355	4.15E-06													
					1762.322	3.9E-06													
					1762.288	3.69E-06													
					1762.255	4.31E-06													
					1762.222	3.74E-06													
					1762.188	3.8E-06													
					1762.155	3.75E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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	Quinn et al. 1996:	mean 4 samples/ yr	Isdale et al. 2001	Anthrop infl >1870	McCulloch, M. et al., 2003	Anthrop infl >1870	Linsley, 2000a			Quinn et al. 1993		Kuhnert et al,1999			Zinke et al, 2004 - Ifaty Madagascar			
o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1762.122	3.7E-06													
					1762.088	3.52E-06													
					1762.055	3.57E-06													
					1762.022	3.49E-06													
					1761.988	3.84E-06													
					1761.955	3.63E-06													
					1761.922	4.04E-06													
					1761.888	4.24E-06													
					1761.855	3.86E-06													
					1761.822	3.56E-06													
					1761.788	4.5E-06													
					1761.755	5.09E-06													
					1761.722	5.39E-06													
					1761.688	3.6E-06													
					1761.655	3.82E-06													
					1761.622	3.74E-06													
					1761.588	4.08E-06													
					1761.555	3.87E-06													
					1761.541	3.69E-06													
					1761.526	3.96E-06													
					1761.512	3.74E-06													
					1761.498	4.04E-06													
					1761.484	4.13E-06													
					1761.469	4.46E-06													
					1761.455	4.24E-06													
					1761.441	4.52E-06													
					1761.426	4.85E-06													
					1761.412	4.86E-06													
					1761.398	8.07E-06													
					1761.384	6.95E-06													
					1761.369	6.62E-06													
					1761.355	5.72E-06													
					1761.341	4.61E-06													
					1761.326	4.29E-06													
					1761.312	4.46E-06													
					1761.298	3.78E-06													
					1761.284	3.89E-06													
					1761.269	4.24E-06													
					1761.255	4.06E-06													
					1761.241	3.98E-06													
					1761.226	3.96E-06													
					1761.212	3.9E-06													
					1761.198	3.41E-06													
					1761.184	4.08E-06													
					1761.169	3.14E-06													

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1761.155	3.54E-06													
					1761.141	4.52E-06													
					1761.126	6.02E-06													
					1761.112	3.82E-06													
					1761.098	3.43E-06													
					1761.084	3.79E-06													
					1761.069	3.5E-06													
					1761.055	3.98E-06													
					1761.041	4.2E-06													
					1761.026	4.16E-06													
					1761.012	4.28E-06													
					1760.998	3.85E-06													
					1760.984	3.74E-06													
					1760.969	3.91E-06													
					1760.955	3.68E-06													
					1760.941	3.83E-06													
					1760.926	3.69E-06													
					1760.912	4.23E-06													
					1760.898	3.65E-06													
					1760.884	3.58E-06													
					1760.869	4.15E-06													
					1760.855	3.67E-06													
					1760.841	4.13E-06													
					1760.826	4.79E-06													
					1760.812	3.62E-06													
					1760.798	4.3E-06													
					1760.784	4.01E-06													
					1760.769	0.000004													
					1760.755	3.72E-06													
					1760.741	3.87E-06													
					1760.726	4.09E-06													
					1760.712	4.08E-06													
					1760.698	3.96E-06													
					1760.684	4.05E-06													
					1760.669	3.92E-06													
					1760.655	4.27E-06													
					1760.641	4.29E-06													
					1760.626	3.65E-06													
					1760.612	3.24E-06													
					1760.598	3.46E-06													
					1760.584	3.24E-06													
					1760.569	3.22E-06													
					1760.555	3.47E-06													
					1760.529	3.7E-06													
					1760.504	3.89E-06													

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year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1760.478	3.99E-06													
					1760.452	3.58E-06													
					1760.427	3.36E-06													
					1760.401	3.41E-06													
					1760.376	3.57E-06													
					1760.35	3.48E-06													
					1760.324	3.59E-06													
					1760.299	3.64E-06													
					1760.273	3.85E-06													
					1760.247	3.42E-06													
					1760.222	4.09E-06													
					1760.196	4.81E-06													
					1760.17	5.28E-06													
					1760.145	3.74E-06													
					1760.119	3.31E-06													
					1760.093	3.51E-06													
					1760.068	3.74E-06													
					1760.042	3.86E-06													
					1760.017	3.85E-06													
					1759.991	3.57E-06													
					1759.965	3.62E-06													
					1759.94	3.68E-06													
					1759.914	3.2E-06													
					1759.888	3.28E-06													
					1759.863	3.6E-06													
					1759.837	3.7E-06													
					1759.811	3.59E-06													
					1759.786	3.77E-06													
					1759.76	3.24E-06													
					1759.734	3.48E-06													
					1759.709	3.83E-06													
					1759.683	4.1E-06													
					1759.658	4.06E-06													
					1759.632	3.91E-06													
					1759.606	3.73E-06													
					1759.581	3.59E-06													
					1759.555	3.77E-06													
					1759.524	3.76E-06													
					1759.493	3.57E-06													
					1759.461	3.98E-06													
					1759.43	4.28E-06													
					1759.399	4.49E-06													
					1759.368	4.69E-06													
					1759.336	4.07E-06													
					1759.305	3.7E-06													

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Lough, J. & Barnes, 2000	standard. Anoms ref'd to 1934-82 mean & SD		Heiss, 1994			Felis et al. 2000		Haase-Schramm et al. 2003		Haase-Schramm et al. 2003			Linsley et al. 1994			Urban et al. 2000		Dunbar et al. 1994		Cole et al. 2000		Charles et al. 1997
year	10 corals	10 corals 5-yr gaussian	Year	o18	stdev	Year	o18	Year	O18 (%PDB)	Year	Sr/Ca	error (2 sem)	Year	d13C PDB	d18O PDB	Year	Mai d18O	Year	o18 PDB	Year	o18	Year

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o18	GRL Age	18O	Year	Flouresence	DATE	Ba/Ca (atomic)	Year A.D.	Sr/Ca	Sr/Ca SST	Sr/Ca SST-ave fil at 8y	QSR Age	QSR 18O	interpolated date	interpolated d13C	interpolated d18O	Year	12C/13C	16O/18O	Sr/Ca
					1759.274	3.79E-06													
					1759.243	3.62E-06													
					1759.211	3.37E-06													
					1759.18	3.56E-06													
					1759.149	3.6E-06													
					1759.118	3.85E-06													
					1759.086	3.65E-06													
					1759.055	3.43E-06													
					1759.024	3.39E-06													
					1758.993	2.99E-06													
					1758.961	3.93E-06													
					1758.93	3.76E-06													
					1758.899	3.37E-06													
					1758.868	3.33E-06													
					1758.836	3.65E-06													
					1758.805	3.33E-06													
					1758.774	3.57E-06													
					1758.743	3.44E-06													
					1758.711	4.62E-06													
					1758.68	4.05E-06													
					1758.649	5.22E-06													
					1758.618	5.15E-06													
					1758.586	4.31E-06													
					1758.555	4.37E-06													
					1758.527	4.76E-06													
					1758.5	4.02E-06													
					1758.472	4.32E-06													
					1758.444	3.95E-06													
					1758.416	4.46E-06													
					1758.389	4.01E-06													
					1758.361	3.77E-06													
					1758.333	3.7E-06													
					1758.305	4.08E-06													
					1758.278	4.38E-06													
					1758.25	4.58E-06													
					1758.222	4.65E-06													
					1758.194	5.68E-06													
					1758.167	4.33E-06													
					1758.139	4.63E-06													
					1758.111	3.49E-06													
					1758.083	3.96E-06													
					1758.056	4.03E-06													
					1758.028	4.31E-06													
					1758	4.45E-06													

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KEY to COLUMN E in Data inventory

Coral	7001 = O-18;
	7002 = C-13;
	7003 = Sr/Ca;
	7004 = calcification;
	7005 = other (fluorescence, density, etc)

Mann et al 1998 used:

Burdekin River	Coral-fluorescence	Precip/Runoff	20S	147E	1746 Lough 1991
Galapagos Isabel Island	Coral-O-18	SST	1S	91W	1607 Dunbar et al 1994
Gulf of Chiriqui, Panama	Coral-O-18	Precip	7.5N	81W	1708 Linsley et al, 1994
Gulf of Chiriqui, Panama	Coral-C-13	ocean circ	"	"	1708 "
Espiritu Santu	Coral-O-18	SST	15S	167E	1806 Quinn et al 1993
New Caledonia	Coral-O-18	SST	22S	166E	1658 Quinn et al 1996
Great Barrier Reef	Coral-band thickness	SST	19S	148E	1615 Lough, personal comm
Red Sea	Coral-O-18	SST/Precip	29.5N	35E	1788 Heiss, 1994
Red Sea	Coral-C13	ocean circ	"	"	1788 "

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From: Michael E. Mann
To: Malcolm Hughes
Subject: Re: proposal
Date: Friday, September 17, 2004 2:31:02 PM

Hi Malcolm.

Sorry to hear about the virus--I hope its ok now...I guess Norton failed?

suggestions look good. I've heard from everyone now, so I should be able to finalize the proposal shortly.

Please update me on your estimated budget and the status of your fastlane temporary proposal ID, PIN, etc. as soon as you have the chance...

Thanks, and enjoy the weekend (tornados here!),

mike

At 05:43 PM 9/17/2004, Malcolm Hughes wrote:

> Mike - later than I thought - I've lost 36 hours with a virus attack
> on my computer. Anyway, just some typos, as you'll see in the
> attached file. Cheers, Malcolm
> .
> .
> Malcolm Hughes
> Professor of Dendrochronology
> Laboratory of Tree-Ring Research
> University of Arizona
> Tucson, AZ 85721
> 520-621-6470
> fax 520-621-8229
>
> The following section of this message contains a file attachment
> prepared for transmission using the Internet MIME message format.
> If you are using Pegasus Mail, or any other MIME-compliant system,
> you should be able to save it or view it from within your mailer.
> If you cannot, please ask your system administrator for assistance.
>
> ---- File information -----------
> File: nsf-esh04913
> Date: 17 Sep 2004, 14:16
> Size: 2165760 bytes.
> Type: Unknown

Professor Michael E. Mann
Department of Environmental Sciences, Clark Hall
University of Virginia
Charlottesville, VA 22903

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http://www.evsc.virginia.edu/faculty/people/mann.shtml

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From: Michael E. Mann
To: raymond s. bradley; mhughes@ltrr.arizona.edu
Cc: wahle@alfred.edu; mann@virginia.edu; Scott Rutherford
Subject: Re: proposal question
Date: Friday, September 10, 2004 8:08:46 AM

HI Ray,

Thanks for the comments.

comments below...

Mike

At 10:37 AM 9/10/2004, raymond s. bradley wrote:

> I'm working on the Holocene proxy records section. In the text the focus is on "paleotemperature" reconstructions. There are a number of these, but many more that reconstruct something else--"strength of the monsoon" (Steve Burns speleothem isotopes in the Indian Ocean), rainfall over the loess plateau (magnetic susceptibility in Chinese loess), etc, or other parameters related to some feature of the climate system (upwelling strength in Cariaco Basin, arguably related to Trade wind strength...or glaciochemical records from ice cores, related to size &/or intensity of the polar vortex...)etc etc. In our previous work we have gladly accepted proxies that carry some sort of signal of the larger temperature field, via an ENSO-related connection or the NAO etc. Should we make the argument here too that many Holocene time series, not strictly calibrated in terms of temperature, may be useful in our quest for paleotemperature reconstruction? If this seems reasonable, it opens up a much larger potential database than just paleotemperature reconstructions.

Yes, I don't see any reason why we shouldn't try to be more general here. In fact, we can frame this in w/ Hugues Goosse's latest work. The point being, that we could use long series of temperature, Monsoon strength, etc.. all simultaneously as a constraint on the long model simulations. No reason to stick to just surface temperature.

The sampling strategy experiments (e.g. Eugene and Scott's contribution) could look at which regions proxies are most likely to constrain such features (e.g. monsoon, ENSO, etc.) as well as just the surface temperature field.

> Second point: to what extent in this section of the proposal should I include references to such studies....I started to do this but it quickly gets out of hand; the danger is that you may include a record that can be seized upon as crap by somebody specialising in that area, or omit some key study by a reviewer! Furthermore, to do this right will be a large part of what we propose to do...

Yes, we should be careful not to claim to rely on the more dodgy records--I'll trust

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your judgement here...

> Third: I assume we are not planning to re-do paleotemperature/paleoclimate reconstructions based on raw data (ie delving into, e.g., the pollen data banks at WDC-A). I am working on the assumption that we will use published time series of diverse parameters that others have argued represent one or more aspects of the climate system. This is a key point as there have been several studies using such raw data sets to reconstruct paleoclimate (Guyot, Bartlein etc) over selected continental areas. I'll cc this to Gene for his thoughts on this.

Yes, see above. I think the ideal way to use these data is on constraints on which of an ensemble of long simulations best matches the observed paleo record (again, drawing on Goosse's latest work).

> Finally, I will say a word or two about the dating uncertainties (which may be the biggest problem in many records) but probably all we can say is that we will careful screen records to selected those that are the best dated...

sounds good to me...

> All thoughts welcome..

Raymond S. Bradley
Director, **Climate System Research Center***
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Morrill Science Center
611 North Pleasant Street
AMHERST, MA 01003-9297

Tel: 413-545-2120
Fax: 413-545-1200
***Climate System Research Center: 413-545-0659**
<http://www.paleoclimate.org>
Paleoclimatology Book Web Site:
http://www.geo.umass.edu/climate/paleo/html
Publications (download .pdf files):
http://www.geo.umass.edu/faculty/bradley/bradleypub.html

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From: Michael E. Mann
To: Malcolm Hughes
Cc: Zhang, Zhihua; fenbiao@ltrr.arizona.edu; Scott Rutherford; rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; mann@virginia.edu
Subject: Re: chronoloy file
Date: Thursday, September 02, 2004 4:39:01 PM

Hi Malcolm,

OK, thanks for clarifying. Well, lets see how the analyses that Zhang does pan out. The initial analyzes using the MXD data should address some of these questions. Clealry, we'll need to do some sensitivity analyes along the same lines using the full database, which includes variously processed tree-ring chronologies, and see how it plays out.

In any case, this is an important issue for us to be keeping in mind as we proceed now. So thanks for the heads up on this.

I'm hoping Zhang and Scott may have some comparisons for us to look at soon,

Mike

At 07:24 PM 9/2/2004, Malcolm Hughes wrote:

> Michael E. Mann wrote:
>
> > Malcolm, I might be misunderstanding you.
> >
> > Many of these (e.g. MXD network) have been processed already to remove these sorts of things, other individuals (Jacoby etc.) don't do this, and I would be extremely hesistant to pre-whiten their data, especially for the low-frequency component.
> >
> > I'm not a big fan of pre-whitening without good reason, i.e. potentially throwing out the baby w/ the bathwater. Scott tried prewhitening the data in the J. Climate paper, and found this degraded the quality of the reconstructions. This is the nature of the point made in the mail I sent the other day.
> >
> > i believe we should use the data as processed and advocated by the original authors. Maybe I'm misunderstanding you though?
> >
> > mike
> >
> > At 03:06 PM 9/2/2004, Malcolm Hughes wrote:
> >
> > > Gentlemen - another nasty thought (!) just crossed my mind. Many of the tree-
> > > ring chronologies (including some of the density series) will contain non-
> > > climatic persistence (Zhang's recent comment reminded me of this). What do
> > > you want to do about it? Maybe whiten all of them? If we ignore this we a) have
> > > fewer degrees of freedom than we appear to have, and b) introduce phoney
> > > persistenceinto the reconstructions. THis could be partucularly important on, for
> > > example, "ENSO" or volcano time scales. Sorry I didn't raise this earlier in the

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discussion (I did raise it in 1997 (!*@#)). Cheers, Malcolm

.

.

Malcolm Hughes
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Professor Michael E. Mann
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http://www.evsc.virginia.edu/faculty/people/mann.shtml

Mike - I had indeed not seen the message you sent yesterday. My intent was to draw attention to the issue, which you had in fact already done. I do have one question, however. Are we sure that the apparently better skill you refer to is real, once one has made the necessary adjustments arising from the non-independence of the yearly values?

By the way, whilst most maximum latewood density index series are whiter than most ring-width series, not all are. It depends, inter alia, on species, so that true firs, for example, have 1st-order serial correlation coefficients similar to those of some ring-width series, but larch do not. Many of the ITRDB ring-width series have not been prewhitened, many have, and a significant number have had the pooled persistence structure reimposed, as Zhang described it. So we have a really mixed bag.

My concern is that you folks who know how to do this stuff are aware of the actual data situation we have. Cheers, Malcolm

---

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From: mem6u@multiproxy.evsc.virginia.edu
To: srutherford@rwu.edu; zz9t@virginia.edu; mann@virginia.edu; rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; fenbiao@ltrr.arizona.edu
Subject: Re: mxd data
Date: Wednesday, August 25, 2004 9:17:41 AM

Dear All,

There is a fine line between guarding ourselves against legitimate criticisms, and bending over so far backwards in fear of spurious criticisms by contrarians that we impose deleterious decisions.

I don't see any problem w/ doing the correlations w/ infilled data. It is very hard to argue that the infilling will produce a false positive--it is much more likely to produce a false negative, and that's being conservative.

So that's my two cents on this. Sounds like we're making good progress. I have only intermittent email access this week, but will try to stay tuned in..

Thanks,

mike
Original Message:

From: Scott Rutherford srutherford@rwu.edu
Date: Wed, 25 Aug 2004 11:54:03 -0400
To: zz9t@virginia.edu, mann@virginia.edu, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, fenbiao@ltrr.arizona.edu
Subject: Re: mxd data

Zhang,

Just to clarify. When you say "Some test experiments of reconstruction are based on the infilled gridded climate data. That is easy to do all the calculations." I think you mean that the correlations between the proxy data and the instrumental data are done on the infilled SLP data and infilled SAT data that we have been working with? if so, then that means that every proxy has a nearby instrumental gridbox (with some number of infilled values) for comparison. This may allow us to keep proxies that otherwise might be discarded due to lack of instrumental data for the correlation. On the other hand, it may be a point of attack by others. Comments anyone?

It sounds like we are just about ready to go then. If you have it all working for the SLP data and the 1099 dendro chronologies we just need to incorporate the remaining proxies and get our selection programs to talk to each other. Can you please send me your latest matlab scripts to do all this so I can see how I have to integrate things?

Thanks,

Scott

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On Aug 25, 2004, at 11:23 AM, Zhang, Zhihua wrote:

> Hi Scott,
>
> Thanks for the update. I'm pleased to see that the hybrid approach is
> an improvement. Do you think we should split the MXD data into 115
> separate files and treat each one as a separate series? That may be the
> easiest way to handle it because it would be consistent with how we
> deal with every other series.
>
> I will split the MXD and put it somewhere in the Holocene.
>
> It seems from your e-mail that the selection process based on
> correlation with instrumental data is in place and working for the tree
> rings? Does that mean all we have left to do is get all the proxies
> together and that all the other steps are working?
>
> Some test experiments of reconstruction are based on the infilled
> gridded
> climate data. That is easy to do all the calculations. I think if all
> the
> proxies are ready, we can do reconstruction.
>
>
> On Aug 24, 2004, at 8:08 PM, Zhang, Zhihua wrote:
>
>>
>> Hi Scott,
>>
>> Thanks for sending me the gridded schweinggruber tree ring dataset.
>> Currently I am testing cold/warm season SLP reconstruction based on
>> 1099-tree ring data-matrix using hybrid frequency approach as well as
>> using
>> raw tree ring/SLP dataset. I am pleasant to tell you that limited
>> results
>> indicate that hybrid frequency approach provides better verification
>> scores. I will do a few more experiments then I will show you and Mike
>> the
>> results. Hope it wouldn't take too long for doing that. Because 115
>> gridded
>> schweingruber series come from 130 schweingruber chronologies and
>> would not
>> provide any more climate information, the 1099-tree ring matrix may be
>> good
>> enough for some test experiments. Deleting 130 chronologies from
>> 1099-data
>> matrix and adding 115 gridded tree ring series may not be a difficult
>> thing.
>> If we have enough time we can do some extra experiments with 115
>> gridded
>> schweingruber series. In my current test, I make use of tree rings
>> that
>> significantly (95% confidence level) correlate with at least one of
>> the two
>> closest SLP grids. If time permit, I may test more schemes.
>>
>> Again, I am happy to have better verification scores with hybrid
>> frequency
>> approach.
>>

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>> Cheers,
>>
>> Zhang
>>
>> -----Original Message-----
>> From: Scott Rutherford [mailto:srutherford@rwu.edu]
>> Sent: Tuesday, August 24, 2004 3:34 PM
>> To: zhihua zhang
>> Subject: mxd data
>>
>>
>> Zhang,
>>
>> Attached is a matlab file with the mxd data. There are three
>> variabiles
>> in the file. "Year" is the year from 1400-1994, "mxdlonglatnew" is the
>> latitude and longitude of the 115 gridboxes.
>> "schweingruber_mxdabd_grid" is the data with the first column having
>> the lat/long of the first row in "mxdlatlongnew". Let me know if this
>> is too difficult for you to deal with. I'm not sure of the best way to
>> deal with this. Should we break the newwork into 115 separate files or
>> keep it together? Some of the gridboxes might pass our test while
>> others might not. What do you think?
>>
>> Thanks,
>>
>> Scott
>>
>>
>>
>>
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From: Michael E. Mann
To: Jonathan Overpeck
Cc: mhughes@ltrr.arizona.edu; mann@multiproxy.evsc.virginia.edu; mark.eakin@noaa.gov; mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu
Subject: Re: revised press release
Date: Saturday, November 18, 2000 5:43:25 PM

Dear All,

I like Ray's revised version too.

I think it retains enough "punch" to justify a press-release, but properly separates out what is truly new about *this* paper from what it isn't.

I say we go w/ this version (or, rather, send it on to Patricia for final revisions) unless there are futher objections??

thanks all (and particular, to Ray!) for the feedback and help,

mike

At 03:32 PM 11/18/00 -0700, Jonathan Overpeck wrote:
>I'm happy with Ray's version too, but can go either way. Thx, Peck
>
>
>>I strongly prefer Ray's version. Malcolm
>>
>>
>>Quoting "Raymond S. Bradley" <rbradley@geo.umass.edu>:
>>
>>> attached (& pasted below) you can find my suggestions for a revised
>>> press
>>> release. You can change it but compare with the earlier version to see
>>> the
>>> change in emphasis. I prefer this, obviously.
>>> Comments?
>>> ray
>>> Patterns of Global Climate Changes Over Recent Centuries
>>> Reported
>>> By NOAA and University Scientists
>>>
>>> Year-by-year patterns of global temperature over the past few centuries
>>> have now been revealed for the first time by a team of University and
>>> NOAA
>>> scientists. Evidence from ice cores, tree rings, corals, historical
>>> records and sediments in lakes was used to obtain the yearly maps,
>>> extending the history of global climate to a time before people began
>>> taking measurements with weather instruments.
>>>
>>> Writing in the online journal Earth Interactions, the scientists note
>>> that
>>> their work highlights periods of unusual climatic conditions, such as
>>> the
>>> period of "dry fogs" that were reported by Benjamin Franklin in the
>>> 1780s. The new study shows that the hazy conditions Franklin described
>>> from his home (at that time, in Paris) was related to a cold episode
>>> that
>>> affected all of Europe for several years following the eruption of a

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>>> volcano in Iceland (Laki) in 1784. Other major eruptions have had
>>> similar
>>> climatic effects. After the eruption of Tambora in Indonesia in 1815,
>>> temperatures in North America and Europe fell sharply, and cool
>>> conditions
>>> prevailed for several years.
>>>
>>> The current study provides an interactive database that can be used to
>>> examine maps of global temperature patterns for any year since 1730
>>> These
>>> are based on natural archives such as ice cores, tree-rings, lake
>>> sediments, and corals, which record seasonal or annual climate
>>> conditions. Data from the natural archives were calibrated by the
>>> instrumental surface temperature data available during the 20th century.
>>>
>>> The study also provided a longer-term view of temperatures across the
>>> northern hemisphere. "The best evidence, based on the extension of
>>> hemispheric climate reconstructions back a full millennium is that late
>>> 20th century conditions are probably warmer than those which prevailed
>>> any
>>> time this millennium," the scientists wrote. They noted that conditions
>>> during the 11th through 14th centuries appear warmer than those which
>>> prevailed during the 15th through 19th centuries in general.
>>>
>>> The scientists also studied the statistical relationship between
>>> variations
>>> in the northern hemisphere mean temperatures and estimates of the
>>> histories
>>> of solar, greenhouse gas, and volcanic factors. "While the natural --
>>> solar and volcanic -- forcings appear to be important factors governing
>>> the
>>> natural variations of temperatures in past centuries, only human
>>> greenhouse
>>> gas forcing alone....can statistically explain the unusual warmth of the
>>>
>>> past few decades," they wrote.
>>>
>>> The scientists are: lead author Michael E. Mann, from the University of
>>>
>>> Virginia; Ed Gille and Wendy Gross, NOAA's National Geophysical Data
>>> Center; Raymond S. Bradley and Frank Keimig, University of
>>> Massachusetts;
>>> Jonathan Overpeck, formerly of NOAA, now with the University of Arizona,
>>>
>>> and Malcolm K. Hughes, University of Arizona.
>>>
>>> The publication, titled Global Temperature Patterns in Past Centuries,
>>> contains the latest look at temperatures over the last 600 years, and
>>> includes data and animations of global temperatures from paleoclimatic
>>> records starting in 1730, up through instrumental data through 1993.
>>> The
>>> publication is available at the NGDC web site in pdf form at
>>> http://www.ngdc.noaa.gov/paleo/ei/ei_pdf.html and in interactive form at
>> >
>>> http://www.ngdc.noaa.gov/paleo/ei/ei_cover.html and at Earth
>>> Interactions
>>> at: http://www.earthinteractions.org
>>>
>>>
>>> ###

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>
>--
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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu
Subject: revisions
Date: Monday, November 20, 2000 2:08:24 PM

HI Malcolm,

Don't know if you had a chance to look over Jeff's revisions. I think you can do a fair amount of editing in incorporating them. The discussion of the specifics results of Park and Mann regarding ENSO and global mean temperature, etc. seems a bit superfluous, and would be better to use that space to relate the multiwavelet approach to the proposal at hand.

In any case, why don't you make a stab at incorporating the changes (and I would advise, doing so sparingly everywhere but the description of the multiwavelet method) then I can have another stab.

I take off for Thanksgiving on wednesday afternoon and don't get back until Sunday afternoon, so I'll only have a slow connection (read, no large attachments please) between those dates. If you can get a revised draft for me to look at wednesday morning or earlier, that'd be great...

mike

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From: Michael E. Mann
To: mhughes@ltrr.arizona.edu
Cc: Jeffrey Park
Subject: revised proposal
Date: Wednesday, November 22, 2000 9:19:03 AM
Attachments: statement-revised.doc
Untitled attachment 00270.txt

Dear Malcolm (and Jeff),

I've taken the latest draft, edited/revised further, and I'm pretty happy w/ it at this point. Since Malcolm needs to get this off today, I'm happy to leave it in Malcolm's hands at this point.

I'll be away for the next 5 days, but will have intermittent access to email.

Cheers, and thanks both for the effort on this,

mike

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Statement of work:

Global multidecadal to century-scale climate oscillations during the last 1000 years

Problem statement

The problem we address is the detection, distribution and analysis of quasiperiodic features in the climate system at time scales approaching the length of the instrumental record. Schlesinger and Ramankutty (1994a) used singular spectrum analysis to identify an oscillation with a period of 65-70 years in 4 global-mean instrumental temperature records. After analyzing 11 regional records, they suggested that this was the statistical result of oscillations at 50-88 years in the North Atlantic Ocean and its bounding Northern Hemisphere continents. Their analytical approach and findings were questioned by Elsner and Tsonis (1994), and defended by them (Schlesinger and Ramankutty, 1994b) on both statistical and modeling grounds. Mann and Park (1994), in an analysis of 100 years of global temperature anomaly data designed to identify coherent spatiotemporal 'modes' of global climate variability, found a significant share of the secular variance to be linked to a roughly centennial mode linked to the North Atlantic. They pointed out that an instrumental record of 100-150 years in length was of limited help in identifying and explaining such oscillations. Mann *et al*. (1995), in a multivariate analysis of a globally distributed set of temperature proxy records of several centuries' duration, produced evidence for persistent natural interdecadal and century-scale climate oscillations. They saw a coherent signal with roughly 50-year period before AD 1650, which got stronger and more significant after that date, drifting into a 60-70 year periodicity in recent centuries. Both the time scale and North Atlantic emphasis of the signal was similar to that identified by Delworth and coworkers (Delworth *et al*., 1993; see also Delworth *et al.*, 1997; Delworth and Mann, 2000) in the GFDL coupled ocean-atmosphere model, suggesting an underlying thermohaline circulation dynamical mechanism of oscillatory behavior.

Interestingly, Dettinger *et al*., (1998) identified an oscillatory mode of similar period in instrumental and tree-ring records of precipitation back to AD 1705 in western North America. This was clearest and strongest in the 20th century, but weaker before then, especially in the 18th century. Hughes and Funkhouser (1998) observed a similar pattern in moisture-sensitive trees in a region centered on the Great Basin, where fluctuations with a period of around 60 to 80 years appear clearly from AD 200 to 600, from 1300 to 1600, and then after 1850. Unpublished results (M.K.Hughes) suggest associations with both SST variation in the Pacific and in the Atlantic for ~70 year features in moisture availability in the American Southwest since AD 1000. The Atlantic connection is particularly intriguing, given the teleconnection in the global precipitation field between the American Southwest and North Africa (Cayan *et al*. 1998).

We plan to place these changing patterns of oscillation in a global perspective for the past 1000 years. This should lead to a clearer knowledge of their spatiotemporal relations, their links to other oscillations (ENSO, AO, NAO) and major climatic

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phenomena. This in turn should lead to the formulation of hypotheses concerning the causes of the multidecadal- to century scale global climate oscillations.

This work has clear **relevance to the scientific goals** of the NOAA/OGP Climate Change Data and Detection program element, particularly goal (3) ”document the quantitative character of observed climate variations and changes”. High-resolution, quality-controlled natural archives of the kinds the PIs have accumulated considerable experience in analyzing present a unique opportunity to address the problem of very large-scale climate variations whose time-scale is close to the total length of the instrumental record. These fluctuations are short enough to be of fairly immediate human concern, especially if they are implicated in modifying the expression of higher-frequency variability such as ENSO (Gershunov and Barnett, 1998). They are long enough to confound the task of detecting anthropogenic climate change. They also seem to be of periods long enough to benefit from an analysis based on 1000 years of record rather than 100. For all these reasons, we argue that this work will be of relevance to the overall NOAA Climate and Global Change Program as well as to the Climate Change Data and Detection program element.

Scientific background

Natural archives and multi-decade to century periodic phenomena.

Multidecadal to century-scale oscillations have been detected in many high-resolution (usually annual) proxy climate records covering recent centuries. Compilations of spectra for proxy records on a worldwide basis have been made by at least three sets of authors, all finding evidence for widespread oscillations of 50-100 years (highlighted). Pulwarty and Diaz (1994) find ‘*sig*nificant spectral peaks’ as follows in a set of records covering all or much of the last 1000 years, using multi-taper spectral estimates (MTM):

Historical evidence for El Nino effects in Peru (Quinn) ~40-60 yr.

Historical evidence for degree of severity of Nile River floods ~40-60yr., ~90 yr.

Oxygen isotopic ration in Quelccaya Ice core, Peru (Thompson) ~25-50 yr.

Tree-ring reconstructed winter rainfall, Santiago, Chile (Boninsegna) ~94 & 125 yr.

SOI Index based on Chinese drought (Zhang) ~70-85 yr.

Tree-ring reconstructed winter precipitation, Sierra Nevada, Ca. (Graumlich) ~35-60 and 100 yr.

Following the earlier study of Mann et al., 1995, Mahasenan et al., 1997, using singular spectrum analysis (SSA), also found ~160 and ~80 yrs to be the ‘most predominant modes’ of oscillation in most of 27 ‘temperature-proxy records’ –tree rings, ice cores and corals. Similarly Stocker and Mysak (1992) calculated or compiled power spectra from some dozens of proxy records of these same types, plus varves and early instrumental records, in an examination of century scale fluctuations. They found notable fluctuations at 300~330, 250, ~200, 160~170, 125~130, 90~110, 60~70 and 50~60 yrs. Minobe (1997) used MTM to identify a 50-70 yr oscillation in N. American temperatures reconstructed from tree rings. Many other authors have identified similar effects in several kinds of proxy records in diverse locations, as indicated in the text box.

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PROXY CLIMATE DATA WITH EVIDENCE FOR NOTABLE 25 –500 YEAR OSCILLATIONS

Northern Hemisphere tree rings

Tree-ring reconstructed Fennoscandian summer temperature, 33~38 years, 89 yrs. *Briffa and Schweingruber, 1992, using variance spectrum.*

Drought-sensitive tree-ring chronologies from the Colorado Plateau 20 – 80 yrs. *Taylor et al., 1992, using evolutive power spectra*.

Southern Hemisphere tree rings

Tree-ring reconstructed warm-season temperatures, Tasmania, 31, 57, 77 and 200 yrs. *Cook et al., 1996, using power spectra*.

8 long Fitzroya cuppressoides tree-ring width index chronologies from the southern Andes, 33, 50, 77, 250 yrs. *Villalba et al., 1996, using Maximum Entropy (ME) spectra and Singular Spectrum Analysis (SSA).*

Greenland ice

Deuterium excess in the GISP2 Greenland ice core. Intermittent 44-80 yrs. *White et al, 1996, using evolutionary power spectra.*

Various chemical species in the GISP2 Greenland ice core, 455, 204, 168, 156, 143, 135, 112, 73, 64, 54, 43, 31yrs, several of these intermittent. *Mayewski et al., 1993, using evolutionary power spectra.*

Coral geochemistry

Urvina Bay, Galapagos Islands coral oxygen isotope record ~ 33 yrs;Gulf of Chiriqui, Panama coral oxygen isotope record ~30 yrs. *Dunbar et al., 1996, using evolutionary power spectra.*

Laminated marine sediments

Santa Barbara Basin, California, sediment mass accumulation rate, ~26.5, 58 yrs. *Biondi et al., 2000, using singular spectrum analysis (SSA).*

Early instrumental data

Central England temperature data, ~100 yrs. *Baliunas et al., 1997 using wavelet analysis.*

An example

Hughes, Ni and Funkhouser (unpublished work) have reconstructed the Pacific Decadal Oscillation from AD 1000 to 1987, using a set of very strongly replicated moisture-sensitive tree-ring chronologies from the western U.S. (Figure 1a). The PDO is described by Mantua et al. (1997) as a ‘robust, recurring pattern of ocean-atmosphere

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climate variability centered over the mid-latitude North Pacific basin'. As index they use the leading eigenvectors of North Pacific sea surface temperatures. The calibrated tree ring records (Figure 1b) were used to extend the PDO record in time (Figure 1c), allowing a comparison with other data for the decades before the calibration period. The trees do capture a major PDO reversal in the late 1800s observed in both instrumental data and other proxy records. There is a striking and significant 73-year periodicity in the PDO reconstruction (Figure 1d), present at varying amplitude throughout the millennium (Figure 1e).

Integrated analyses

Although abundant evidence for multidecade to century scale climate oscillations exists, only limited attempts have been made to examine relationships between these records. Mann et al. (1995), compiled a climate-proxy data set for the last 500 years (Figure 2), which they analyzed using the MTM-SVD method (Mann and Park, 1994;1996;1999). The MTM-SVD method (see further discussion below) allows for the detection of coherent patterns of variability among multiple records which have a common preferred oscillatory timescale. The method provides a multivariate spectrum, the "LFV" spectrum, which can be used to detect the presence of coherent oscillatory patterns at varying frequencies. The LFV spectrum for the sparse dataset used by Mann et al (1995) is shown along with that of the global surface temperature dataset, and that of a sparse, approximately spatially co-located set of instrumental summer temperature gridpoint series during a period of overlap during the 20th century (Figure 3). The comparison indicates the potential faithfulness with which the frequency-domain analysis of the multiproxy data captures the frequency-domain structure of the instrumental record itself, given an adequate enough spatial network of proxy data.

Of particular interest in Figure 3 is a "multidecadal" 50-70 year oscillatory signal described by Mann et al (1995), corresponding to the frequency range where the proxy-instrumental comparison is most favorable. An "evolutive" version of the MTM-SVD spectrum shows evidence for a robust signal on this timescale in the data during the past few centuries (Figure 4). The pattern of is the signal (Figure 5) is global, but there is particularly prominent North Atlantic signature, suggesting a possible origin in this region. Recent comparison between model simulations and the Mann et al (1998; 1999) spatial temperature reconstructions shows consistency between the signal in the paleoclimate record during the past few centuries, and that exhibited in long control integrations of the GFDL R15 and R30 coupled ocean-atmosphere model (Delworth and Mann, 2000). Furthermore, the model simulations substantiate an origin of the signal in the North Atlantic thermohaline circulation, with an apparent larger-scale atmospheric response. The comparison, however, is hampered somewhat by the limited spatial detail in key regions in the Mann et al reconstructions, which approximate the signal in question in terms of a small number of standing temperature patterns. This limitation is further discussed below.

We will apply an analogous signal-detection approach in the proposed work, taking advantage of a greatly enhanced proxy data set, and exploiting recent refinements in the multivariate signal detection techniques discussed above (Mann and Park, 1999; Park and Mann, 2000). This includes supplementing the "evolutive" multivariate spectral analysis of Mann et al (1995) with a wavelet-based signal detection approach that Park

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and Mann (2000) have successfully applied to examining changes in the spatiotemporal character of ENSO in the instrumental record. We plan to extend the climate proxy analyses to cover at least the period since AD 1000.

Statement of research questions

What robust multidecadal to century scale features of climate fluctuation does a global multivariate analysis of the last 1000 years reveal?

What are the characteristic features of these fluctuations in space and time, in particular, how do they migrate spatially, and how do their periods fluctuate through time?

How do the multidecadal to century-scale features of the instrumental period compare to those of the last 1000 years? In particular, does the 20^{th}-century relationship between the ~70 year fluctuation in the North Atlantic and multidecadal features elsewhere in the world extend into the past? Are mid-millennium changes in the multidecadal oscillations, inferred in western North America and its continental margin, expressed elsewhere?

What reasonable dynamical interpretations can be made of the patterns of spatially-coherent multidecadal variability in long-term proxy data?

Methods

Selection of records to use.

We plan to use existing quality-controlled annual resolution proxy records valid for all or most of the last 1000 years, as there is reason to expect a change in behavior of the climate system about 500 years ago (Biondi et al., 2000, Hughes and Graumlich, 1996). The records we use will be drawn from as many parts of the world as possible, and as representative of its different major regions and components as possible. We would also consider using records of decadal resolution if their age control is adequate for this task. In addition to sound chronology, these records must have a demonstrable relationship to some element of local climate. There has been a considerable growth in the availability of such records since Mann *et al*. published their 1995 analysis, and an increase in the care and attention given to conserving multidecadal to century scale fluctuations in their preparation (e.g. Hughes and Graumlich, 1996; Hughes and Funkhouser, 1998). We are at a late stage in assembling this data set for our work on reconstructing global temperature fields from natural archives (Mann, Bradley and Hughes, 1998) but had not planned to conduct the type of analyses proposed here as part of that work. We hope to take advantage of currently funded efforts to assemble a global database in this proposal to investigate past oscillatory climate fluctuations. We will screen the available data for those with annual to decadal resolution and chronological precision, evidence of a simple relationship to local climate, absence of distortion of 30-100-year time scale signal and coverage of all or most of the period AD 1000-2000. We will use proxy records of soil moisture, precipitation and other climate system variables, as well as temperature. Such an approach allows the examination of seasons and regions for which good temperature proxies are rare, and contributes to the capture of information

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on large-scale climate patterns, as demonstrated in our work on reconstructing hemispheric temperatures (see below).

This approach will allow us to include newly available annual resolution data, including the latest millennial-scale dendroclimatic reconstructions (see Figure 6) and ice core data (O-18, and chemical species) from Greenland (e.g.,Mayewski et al, 1994), the Canadian Arctic, low latitude sites and Antarctica which were not used in our prior work, and other sources of information with lower temporal resolution but long temporal coverage e.g. high resolution (varved) lacustrine and (varved or high deposition rate) sediment records (e.g., Keigwin, 1996), banded speleothems and historical documentary data from China and Europe (e.g. Pfister, 1998).

Quantitative methods.

One approach to analyzing the complementary information in a diverse set of proxy climate indicators in paleoclimate reconstruction is to statistically relate this information to the leading patterns of variability which can be resolved in the modern instrumental record, and use this modern "calibration" between the instrumental record and proxy indicators to estimate large-scale climate patterns back in time, prior to the instrumental record. This approach has been highlighted in the recent work of Mann, Bradley, and Hughes (Mann et al, 1998;1999;in press; Bradley et al, in press), with applications to large-scale surface temperature pattern reconstruction (Mann et al, 1998;1999), reconstruction of the ENSO phenomenon (Mann et al, 2000), the North Atlantic Oscillation (Mann, in press; Cullen et al, in press), multidecadal North Atlantic surface temperature patterns (Delworth and Mann, 2000), and patterns of forced climate variability (Mann et al, 1998;in press; Waple et al; accepted). Cross-validation experiments (Mann et al, 1998;1999) have demonstrated the considerable skill with which it is possible to reconstruct the spatiotemporal patterns of past climate change using such an approach. Furthermore, the frequency-domain structure of these climate reconstructions has been examined (Mann et al, 1999; Delworth and Mann, 2000). However, the underlying approach, while optimal in terms of its *time domain properties*, is <u>not</u> optimal in terms of its *frequency-domain properties* (see Mann and Park, 1999). Oscillatory climate signals typically contain spatially-propagating features, which are associated with variable lag-lead relationships between fluctuations in different regions. Such variable time delays are best analyzed with frequency-domain methods at the level of the raw data series, which naturally describe a coherent oscillatory pattern with a spatially-variable pattern of phase. The use of time-domain eigenvectors as an intermediary step offers no real advantage in this context. In fact, it represents a hindrance. When the data contain an oscillatory climate signal with spatially propagating features (e.g. as in a typical El Nino event), the true lag-lead relationships are unlikely to be faithfully retained in an "eigenvector" reconstruction which approximates the data as a superposition of a small number of standing (rather than propagating) patterns. See Mann and Park (1999) for a thorough discussion of this point.

For this reason, we propose to revisit the work of Mann et al (1995), which was based on the direct application such a method (the MTM-SVD method) using the considerably more widespread and longer proxy climate database that is now available (see previous paragraph and Mann et al, 1998;1999). These proposed investigations are synergistic with a currently NOAA-funded proposal supporting the investigators' efforts

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to expand the multiproxy database for improved spatial pattern reconstructions, since these enhancements of the database will allow for improved analyses of frequency-domain structure. Moreover, the frequency-domain approach lifts the restriction of annually-resolved proxy data which was required in the time-domain reconstructions of Mann et al (1998;1999), allowing lower (ie, decadal) resolution proxy indicators to potentially supplement the network of annual resolution indicators in analyzing spatiotemporal patterns of past climate variability in the frequency domain.

The MTM-SVD approach of Mann and Park is described in detail by Mann and Park (1994;1996;1999). It exploits the optimal properties of multiple taper spectral analysis (Thomson, 1982; Park et al 1987) in isolating narrowband patterns of climate variability that are statistically significant relative to the null hypothesis of spatially-correlated colored climate noise. The use of multiple tapers allows for a spatiotemporal decomposition that is performed *locally* in the frequency-domain, as opposed to other multivariate frequency-domain decompositions (e.g. Complex Harmonic Principal Components Analysis-see Mann and Park, 1999). This important distinction allows for a higher signal-to-noise ratio in the detection of narrowband spatiotemporal signals than conventional methods. Moreover, this attribute of MTM-SVD naturally provides for an extremely flexible null hypothesis of spatially-correlated colored to be invoked in signal detection. The MTM-SVD analysis produces a multivariate spectrum (the local fractional variance or "LFV" spectrum) which measures the amplitude of the principle mode of spatiotemporal variability at a particular frequency, relative to the expected noise background at that frequency. This parameter can be compared against expectations under the null hypothesis of spatially correlated colored noise to determine the statistical significance of an apparent narrowband spatiotemporal climate signal. The method also allows for the reconstruction of the spatial and temporal pattern of an associated signal. Earlier in this proposal (see 'Scientific background') we cite the example of the work of Mann et al, 1995, using this approach, as evidence of its potential. With the more widespread proxy data set we are currently collating, we expect to be able to describe in far more detail the spatiotemporal attributes of past multidecadal climate variability.

A generalization of the MTM-SVD method employing wavelets rather than a Fourier basis has recently been developed and applied to the instrumental temperature record (Park and Mann, 2000). The "multiwavelet" analysis is similar to the "evolutive" MTM-SVD analysis, which uses a fixed-duration time window that steps through a longer time series. The "multiwavelet" SVD method allows the time window to stretch with the targeted oscillatory period, cross-correlating different data series over a fixed number of oscillations. The "multiwavelet" approach is suited for the analysis of oscillatory climate signals, such as ENSO, that have a strongly event-like character, remaining coherent for little more than an oscillatory cycle or two. Using this approach, Park and Mann (2000) found that decade-long ENSO "episodes" could be isolated in the 20^{th} century, each consisting of a few El-Niño/La-Niña cycles with a similar spatiotemporal pattern. Evolutive MTM-SVD analysis of multiproxy data (Mann et al 1995) suggests secular modulation in the amplitude and frequency of multidecadal and century-scale climate signals over the past few centuries. Changes in the spatial pattern of this variability, however, have not yet been investigated. We propose to apply the multiwavelet analysis approach to the longer and more complete multiproxy dataset now being assembled. Comparison of inferences from the MTM-SVD and multiwavelet

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analyses of the data will lead to more robust description of the spatial and frequency-domain character of past multidecadal climate variability.

Interpretation and climatic implications

Two main categories of explanation have so far been advanced for the existence of persistent, spatially coherent climate oscillations whose wavelength approaches the length of the instrumental record. In one, these oscillations are forced externally by changes in the quantity or nature of solar receipts. In the other, they result from the unforced natural variability of the climate system. Taylor et al. (1992) note ‘a close correspondence between times of low sunspot activity and abrupt changes in the power spectrum observed….’ in tree-ring width chronologies from the Colorado Plateau. Stocker and Mysak (1992), on the other hand, use a two-dimensional ocean model to demonstrate that the ‘thermohaline circulation of the Pacific-Atlantic basin may exhibit such cycles, and further describe the spatial expression of these cycles in their model in a manner that would allow testing against proxy data. By producing evidence of the global spatial expression of these oscillations for a time period 10 to 14 times their length, we will provide opportunities for testing such hypotheses.

Responsibilities

The PI will be responsible for general oversight of the project, supervision of the postdoctoral fellow, and the coordination of publication of results. Drs. M.E. Mann and J.Park, through subcontracts to the University of Virginia and Yale University, will be responsible for the tasks that are the subjects of those subcontracts.

Products

The results of this work will be submitted for publication in relevant peer-reviewed journals. No new data will be generated, but where derived data are produced, they will be made available through World Data Center ‘A’ for Paleoclimatology.

Benefits of proposed project to general public and scientific community

The proposed project will provide insight into low frequency changes in the climate system that will underlie whatever anthropogenic changes take place in the future. Recognizing that both "natural" and anthropogenic changes can be expected in future is of great importance in anticipating the overall changes that may take place. Understanding the spatial and temporal expression of such changes in climate is an important goal to verify that model simulations have incorporated all relevant processes. With the release of the 2001 IPCC assessment, public interest in climatic change and media discussion of the various issues will be high and research on this project will be of direct relevance to public concerns over past and future climate changes.

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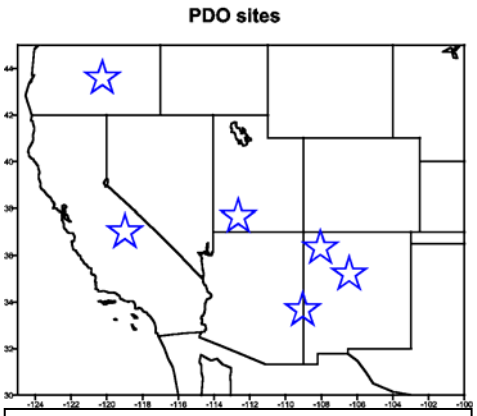

Figure 1a: location of tree-ring sites for PDO reconstruction

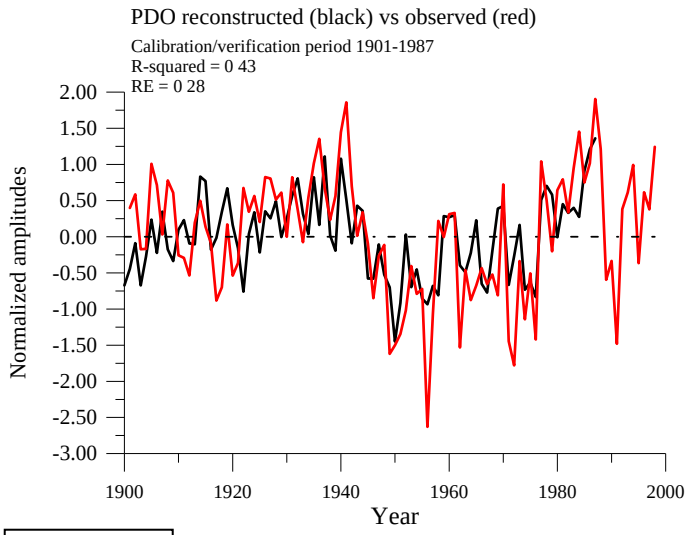

Figure 1b: calibration

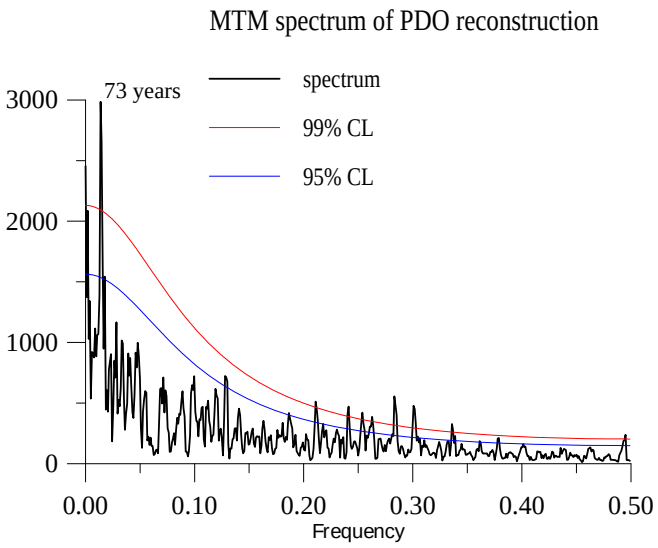

Figure 1d

Figure 1c: PDO reconstruction

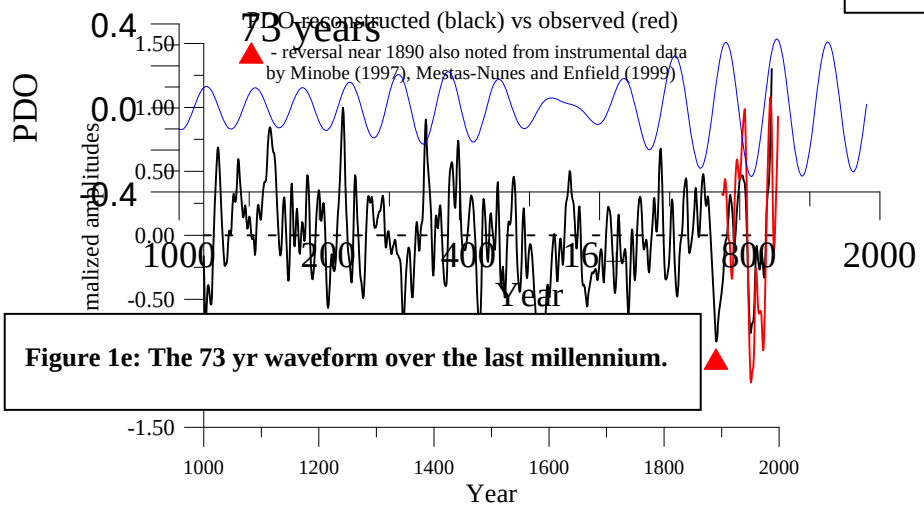

Figure 1e: The 73 yr waveform over the last millennium.

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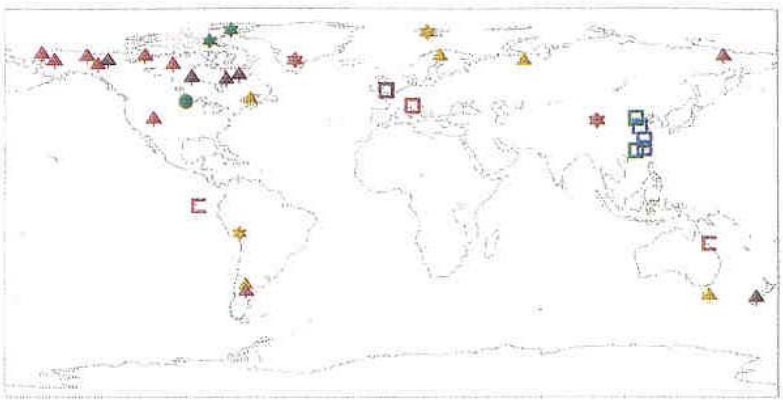

Figure 2. Distribution of a relatively sparse network of decadal or higher resolution proxy climate indicators used in MTM-SVD analysis to determine significant narrowband signals (from Mann et al, 1995--see for an explanation of the symbols for different types of proxy climate information). The proxy data in this case were largely, though not exclusively, believed to be summer temperature indicators.

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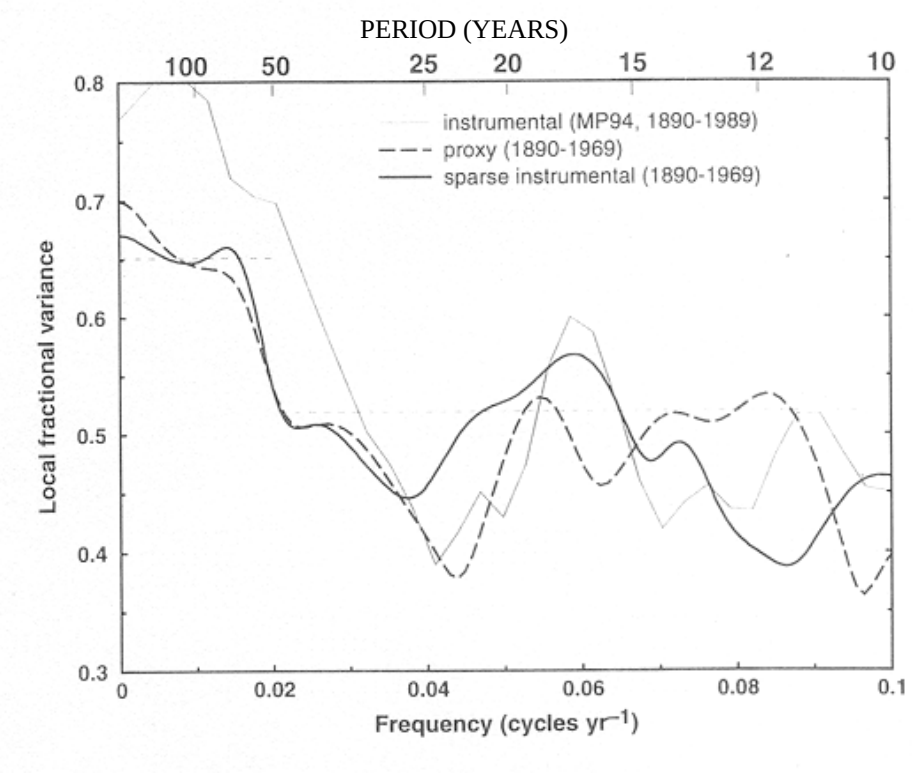

Figure 3. LFV spectrum (from Mann et al, 1995) resulting from MTM-SVD of (i) sparse proxy data shown in Figure 1, (ii) co-located instrumental surface temperature data, and (iii) globally extensive surface temperature gridpoint data used by Mann and Park (1994). Note how closely the LFV spectrum of the sparse proxy data approximates that of the co-located instrumental surface temperature data during the period of overlap, *particularly at multidecadal timescales*.

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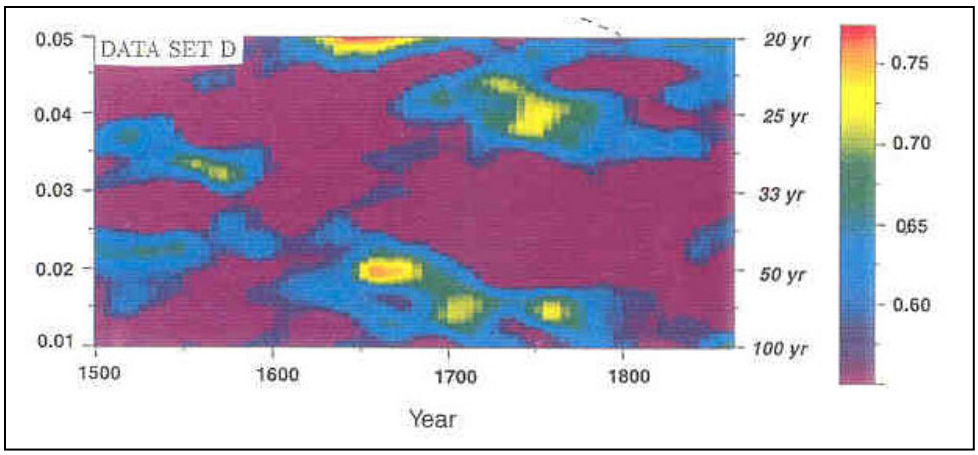

Figure 4. Evolutive LFV spectrum (from Mann et al, 1995) resulting from MTM-SVD of decadal and higher-resolution proxy data shown in Figure (1) with a 200 year moving window. Features visible above the purple background are significant above the 90% confidence level, with "warmer" colors indicating greater significance.

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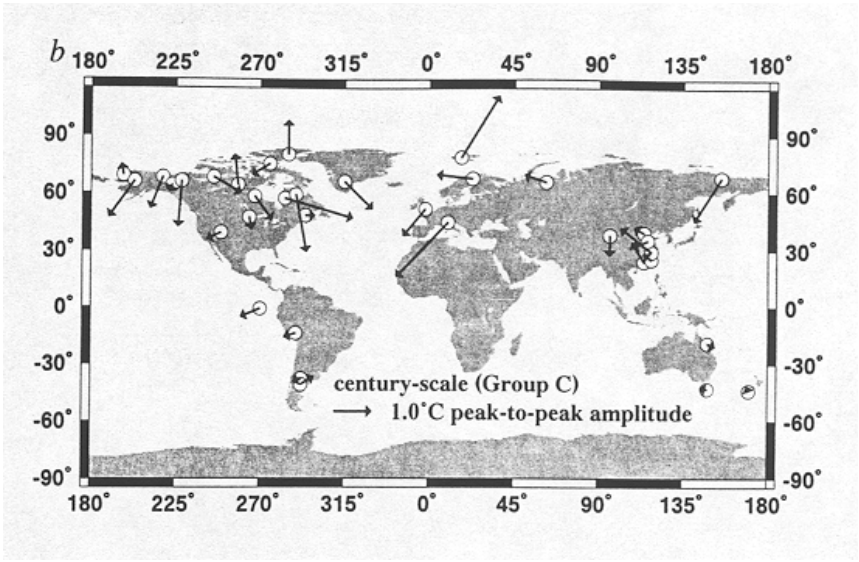

Figure 5. Spatial pattern of multidecadal oscillatory climate signal evident in Figure 3. The length of the arrow at each site indicates the relative amplitude of the signal, while the direction represents the relative lead/lag between peak amplitude of the signal spatially, with counterclockwise rotation indicating positive lag. For example, peak amplitude of signal in Svalbard is approximately twice that in Southern Greenland or Fennoscandia, with peak amplitude occuring roughly 1/4 cycle (approximately 50yr/4 = 12 years) earlier in Svalbard than in Fennoscandia, and approximately 12 years later in Svalbard than in Southern Greenland, with Southern Greenland and Fennoscandia roughly anticorrelated. These lag-lead relationships are interpreted dynamically by Mann et al (1995) and related to the model-based observations of Delworth et al (1993).

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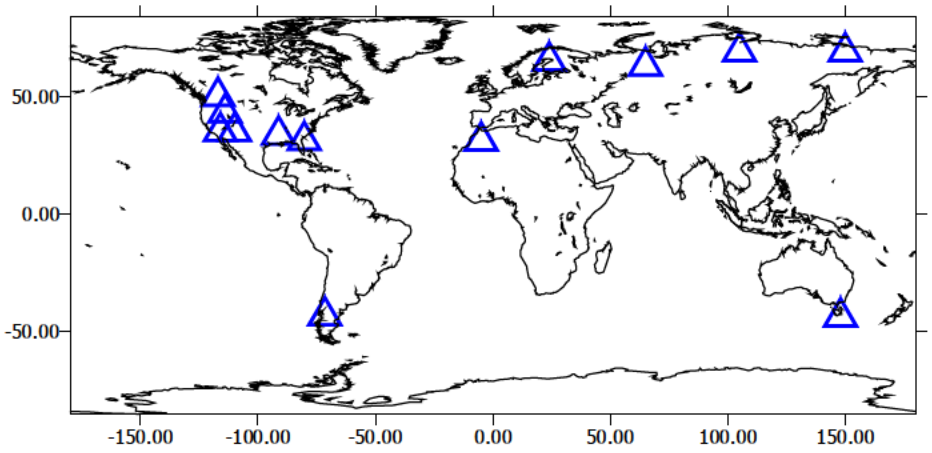
Figure 6. Locations of regions with **strong** dendroclimatic reconstructions extending back to before AD 1000 (see Jones et al, 1996 and chapters within; Briffa et al, 1992; 1995; Naurzbaev and Vaganov, 19998; Hughes et al, 1999; Chbouki, et al, 1995). All have been prepared by methods designed to conserve century-scale variability, and most show evidence of such features. Several, notably those in the conterminous United States and southern South America, are based on multiple site chronologies.



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From: Jeffrey Park
To: mhughes@ltrr.arizona.edu; mann@virginia.edu
Subject: try again
Date: Monday, November 20, 2000 1:32:28 PM

Dear Malcolm and Mike,

In the next email message is a WORD document based on the last proposal draft that was sent to me. If you do not receive it or cannot read it, send email.

I have chewed the prose of the technical description to make the sentences shorter and to intersperse time-series jargon with some descriptive comments. I have also described the multiwavelet algorithm by analogy to evolutive spectrum analysis and described its past application to 20th century ENSO. My changes are underlined in the text, using WORD formatting.

Note that the take-home results of Mann et al (1995) were not spelled out in the last text version. Since we are proposing to apply the same methodology to a larger dataset, I took a stab at writing a reviewer-teaser. Please feel free to modify. Also, Mike should be the final arbiter of what level of technical description is best suited for getting the proposal a positive review. My bias is to add sentences that a non-specialist can latch onto. You need to check that my down-homisms, such as they are, have not introduced any naive statements into the text.

Jeffrey

additional references in text:

Park, J., C. R. Lindberg and F. L. Vernon III, Multitaper spectral analysis of high frequency seismograms, J. Geophys. Res., v92, 12675-12684, 1987.

Park, J. and M. E. Mann, Interannual temperature events and shifts in global temperature: A multiwavelet correlation approach, Earth Interactions, v. 4, online paper 4-001, 2000. PDF of accepted manuscript at ftp://love.geology.yale.edu/pub/park/EI012/ei012final.pdf

Thomson, D. J., Spectrum estimation and harmonic analysis, IEEE Proceedings, v70, 1055-1096, 1982.

Coming next: prop3.doc in WORD97 format

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From: Michael E. Mann
To: Malcolm K. Hughes
Cc: Michael E. Mann; Malcolm Hughes; srutherford@virginia.edu; ray Bradley
Subject: Re: Luterbacher
Date: Friday, January 04, 2002 9:13:40 AM

Hi Malcolm,

Do you want to send off the same email to Phil, Keith and Tim?

Thanks,

mike

At 08:05 AM 1/4/02 -0700, Malcolm K. Hughes wrote:
>I agree and suggest tat you add in comparison with the pressure
>reconstructions
>reported in the paper with a thousand authors headed up by Phil (in the
>file I
>sent Scott). CHeers, Malcolm
>Quoting "Michael E. Mann" <mann@virginia.edu>:
>
> > HI Malcolm,
> >
> > This letter looks great to me. Regarding Phil, you make a good point. We
> >
> > could ask Tim, Phil, and Keith to write a letter indicating their
> > interest
> > in continuing w/ the comparisons that Scott, Tim, and I have already
> > been
> > doing w/ the MXD and multiproxy datasets.
> >
> > Thoughts?
> >
> > mike
> >
> > At 11:01 PM 1/3/02 -0700, Malcolm Hughes wrote:
> > >Here's the text of the message I propose sending to the Swiss
> > >guys - we should probably also send something similar to Phil
> > >Jones. What do you think? Malcolm:
> > >Dear Heinz and Juerg,
> > >Many thanks for the Christmas card. I have a request. Mike
> > >Mann, Scott Rutherford, Ray Bradley and I are preparing a
> > >proposal to continue our large-scale reconstruction work. One
> > >of its major emphases will be the use of proxies to reconstruct
> > >sea level pressure on a hemispheric scale for as far back as the
> > >available paleoclimatic data will allow. Obviously, the work in
> > >which you have been involved, reconstructing both pressure
> > >over a very significant sector of the Northern Hemisphere, and
> > >the North Atlantic Oscillation, has provided a wonderful basis
> > >for comparison for any effort such as the one we propose.
> > >Therefore, we very much hope that it will be possible for us to
> > >collaborate in this way, using your reconstructions as an
> > >independent source of verification data back to AD 1675, of
> > >course, in consultation with you.
> > >If you agree, it would be very helpful if you could fax a letter
> > >saying this to me at 1-520-621-8229. If you have any
> > >questions about this, please do not hesitate to contact me.

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> > >Happy New Year! Malcolm
> > >Malcolm Hughes
> > >Professor of Dendrochronology
> > >Laboratory of Tree-Ring Research
> > >University of Arizona
> > >Tucson, AZ 85721
> > >520-621-6470
> > >fax 520-621-8229
> >
> > _____
> > Professor Michael E. Mann
> > Department of Environmental Sciences, Clark Hall
> > University of Virginia
> > Charlottesville, VA 22903
> > _____
> > e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137
> > http://www.evsc.virginia.edu/faculty/people/mann.shtml
> >
> >
> >
>
>
>
>Professor Malcolm K. Hughes
>Laboratory of Tree-Ring Research
>W.Stadium 105
>University of Arizona
>Tucson, AZ 85721
>phone 520-621-6470
>fax 520-621-8229

_____

Professor Michael E. Mann
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University of Virginia
Charlottesville, VA 22903

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From: Raymond S. Bradley
To: Michael E. Mann
Cc: mhughes@ltrr.arizona.edu
Subject: Re: GRL etc
Date: Tuesday, July 15, 2003 8:44:08 AM

No problems really, other than the need to keep lines of communication clearer. Of course, I'm not trying to limit who you collaborate with, but this topic seemed absolutely central to what we said in our ESH proposal that we were planning to do! And, as you know, in the current "climate", any "new" series that gets published becomes an instant celebrity, so you have to be pretty confident that it will stand up to scrutiny.
I did not know about the GRL work until it surfaced in the EOS article --- & as I noted to Phil, there were some series included in that that I would not have recommended. In Nice, you talked about the planned Reviews of Geophysics article, but the GRL paper took me by surprise. Given the weighting exercise that you employed, it seems that the 2000 year record is pretty much dominated by Yamal/Taimyr/Tornestrask, W. US & the Yang China series in the NH. The map shows three sites in Greenland, but Phil shows only a composite (stacked) series from Dave Fisher that extends back to ~AD500...
I don't know what Antarctic series you used in the SH but otherwise, that series is dominated by just Tasmania. So, given the dominance of tree-ring records, & the duplication with Briffa et al. for the NH, it would have been useful to get Malcolm's input on the data selected. He knows much more about this than Phil, or you & I. I am particularly sceptical about the tree ring series used in the Yang et al composite, but again Malcolm is in the best position to evaluate these, &/or to suggest better series. And he nows the Siberian data particularly well...

Anyway, we do probably need to meet more often--either by phone or collectively to make sure we are not crossing wires. With relatively few series available, there's not much point in us all pursuing them independently. But more importantly, we don't want to end up with two papers within a few months of each other postulating different results. This will only provide fire for you-know-who...
I'm not sure if Malcolm is back yet from Taimyr....maybe later this week. So, maybe it's best to schedule a conference call for early next week. I go to INQUA on 7/23.

Ray

At 10:24 AM 7/15/2003 -0400, you wrote:
>HI Ray,
>
>I had no idea you or Malcolm fealt like this.
>
>It looks like there has been a communication breakdown,where I didn't
>perceive their was one. I'm pretty sure that I had informed you and
>Malcolm fully of the limited two-millennium extension I was doing w/ Phil,
>which is just a composite (like Bradley and Jones), not the full pattern
>reconstructions that we're in the process of doing together. It was an
>'initial' result that Phil and I tried to work on quickly (hence we didn't
>involve a whole bunch of others, which hopelessly slows down the process)
>to both confront the recent controversy, and to provide a longer-term
>framework to discuss in the review article we're working on. But the more
>interesting work, in my opinion, is the full pattern reconstructions. The

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>composite that Phil and I have done will provide a useful comparison for a
>more rigorous N. Hem reconstruction based on the average of our patterns
>back 2K--and the patterns themselves will tell a lot more. I'm sure there
>is a Nature article in that (note that Phil and I didn't try to go to
>Nature or Science w/ this).
>
>By the way, the data was only for that GRL article. Lonnie/Ellen just sent
>us some of Lonnie's ice core data, but it was too late (see forwarded
>email!). But I put it in my data directory and made a note to give it to
>Scott for use in our work!!
>
>I thought that collaborating w/ Phil on a couple papers would go a very
>long way (in combination w/ our joint paper Scott is working on
>finalizing) to restoring an appropriate level of collegiality between our
>respective groups (you, me, and Malcolm vs. Phil, Keith, and Tim), and
>that's part of the impetus for doing the GRL and the Reviews of Geophysics
>paper w/ him in the context of a "two-body" problem (writing either of
>these would have been difficult w/ multiple authors)
>I didn't think think the paper w/ Phil was a problem--Malcolm has been
>working independently of you and me w/ other groups (Alexey Kaplan, Mike
>Evans, and others) on reconstructions of PDO, drought, etc. and you've
>been doing work w/ Lonnie, Alexey, Mike Evans, Alexey Kaplan, etc.
>independently of us on tropical Pacific SST reconstructions. You and
>Malcolm have a nice chapter in the PAGES book that I'm not involved in,
>and there is this medieval paper that you're working on w/ no involvement
>on my part--and I've always been fully comfortable with this. So I assumed
>(perhaps incorrectly?) that we had all become comfortable w/ the idea that
>we might collaborate occasionally w/ others on related projects, though I
>expect we'll remain the closest of colleagues (and friends!) for the rest
>of our careers.
>
>So if I've done anything that might interfere w/ this, we should talk
>about. We could try to organize a conference call w/ the 3 of us this
>morning (I'm at home, 434-244-9955). I have to leave for the airport
>(flight to seattle) around 1:30 pm, so it should be in the morning,
>
>mike
>
>At 09:40 AM 7/15/2003 -0400, you wrote:
>>Mike:
>>I think we (MKH & I) need to know what your further plans are with
>>Phil. The GRL paper came as a complete surprise to Malcolm & I -- we
>>thought that this was the sort of thing that we were funded by NOAA to
>>do! I've been gathering together long-term data sets & now find that
>>both you & Phil have been in touch with Ellen M-T to get the oxygen
>>isotope data for the S. American & Tibetan ice cores that I showed in my
>>EGS Nice talk...
>>This all reminds me of the DoE project that I was supposedly
>>collaborating on with Phil years ago where every time I turned around I
>>found that we were reading on each others toes. We need to get it clear
>>what we are all doing. I know Malcolm was surprised to see the tree ring
>>series that you selected in the GRL piece, as he has been evaluating what
>>the best records are that we should be using in our reconstructions...
>>Anyway, we need to be upfront about what we are working on, or this will
>>become very frustrating..
>>As you know, I'm (slowly!) working on a short piece on Climate in
>>Medieval Time, but this will not include anything more than what I said
>>in Nice. If it seems justified once I get that done, it might be worth
>>extending this theme to a longer review-type article, but I'm not sure
>>yet if there is anything sufficiently new to justify that.

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>>ray
>>
>>
>>
>>Raymond S. Bradley
>>Distinguished Professor
>>Director, Climate System Research Center*
>>Department of Geosciences
>>Morrill Science Center
>>611 North Pleasant Street
>>AMHERST, MA 01003-9297
>>
>>Tel: 413-545-2120
>>Fax: 413-545-1200
>>*Climate System Research Center: 413-545-0659
>> <http://www.paleoclimate.org>
>>Paleoclimatology Book Web Site: http://www.geo.umass.edu/climate/paleo/html
>>
>>
>_____
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> Charlottesville, VA 22903
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> http://www.evsc.virginia.edu/faculty/people/mann.shtml

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<http://www.paleoclimate.org>
Paleoclimatology Book Web Site: http://www.geo.umass.edu/climate/paleo/html

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From: Michael E. Mann
To: Ray Bradley; mhughes@ltrr.arizona.edu
Cc: mann@virginia.edu
Subject: Re: helpful comments from Henry
Date: Tuesday, February 22, 2000 12:52:42 PM

Thanks Ray,

Good advice from Henry. The discussion of Waple et al, Cubasch et al, sensitivity, etc. is seeming gratuitous to me now, although I'm the one who put it in there. I think we *would* do well to excise that and shorten the piece in the process.

The more important point is in the discussion of Crowley and Kim (1999), which could, as Henry suggests, be rephrased:

Crowley and Kim (1999), using an energy balance model, estimate that as much as 18-34% of low frequency variability in proxy-based hemispheric temperature reconstructions over the preanthropogenic interval could be forced by volcanism and solar variability. Most importantly, they show that the spectrum of the residuals (ie, the remaining component when this forced variability is accounted for) agrees with that of unforced variability from control runs of coupled models at the 90% significance level. In other words, the estimated level of natural variability in the proxy-based temperature series is as similar to the models as the models are to each other.

At 02:15 PM 2/22/00 -0500, Ray Bradley wrote:
>Hi Ray -
>
>I read over the reply text. It artfully sticks the knife in with the
>proper reserve.
>
>Some comments. On page 3, second para. Change the word "thoroughly
>unwise" to:
>
>Finally, we believe that relying on computer models without the validated
>ability to model century and longer timescale variability to estimate the
>actual low-frequency variability of the climate is emphatically unwise.
>
>In the same para.:
>
>it is self-evident that global climate models can never be relied upon to
>give a definitive description of the natural variability of the true
>climate system.
>Change to: "it is self-evident that global climate models can not now, or
>in the foreseeable future, be relied upon to give a definitive description
>of the natural variability of the true climate system.
>
>and change
>
>and numerous potential surprises regarding the true global climate system
>(e.g., the role of gas hydrates) will forever limit the ability of models
>to accurately represent the true system.
>
>to
>

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From: Ray Bradley
To: mann@virginia.edu; mhughes@ltrr.arizona.edu
Subject: BAMS final?
Date: Wednesday, March 01, 2000 9:58:13 AM
Attachments: BAMS final.doc
Untitled attachment 00319.txt

I was about to send this out, but took one final look. It seems to me the message we wish to get over has been diluted by going into too much detail in one or two places, which may divert attention from the main points.
In the attached file, I have highlighted 3 places in red font. Take a quick look and see what you think. Removing these sections tightens it up a bit, without losing the focus. I'm not saying these points are wrong, just a distraction.....& the final sentence leaves the argument a bit flat -- and confusing to the reader who might wonder: aren't we all in agreement in the end? (this is due to the many inconsistencies in their paper -- but we don't need to acknowledge with that).
ray

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http://www.geo.umass.edu/climate/paleo/html

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Comments on

"Detection and Attribution of Recent Climate Change: A Status Report"

Raymond S. Bradley[1], Malcolm K. Hughes[2] and Michael E. Mann[3]

Barnett et al (1999) provide an excellent review of progress in model-based detection and attribution during the past few years. Unfortunately, the section on "Paleoclimate proxies" is flawed. Here we point out several issues that lead to erroneous conclusions in their paper.

1. They state: "Straightforward comparisons via cross-spectral analysis…show that most of the paleodata are not simple proxies of temperature". The authors might have added, "…, as most paleoclimatologists familiar with such data already know." Those who routinely work with such data recognize that careful calibration of each record is required to extract the appropriate signal, which may be primarily temperature or precipitation, or sometimes both, and is often very specific to a particular season. No information is given on what temperature variable for which season was used in the calculation of correlations and coherency-squared in their Table 1, and so the reader is not able to judge the appropriateness of the comparisons reported there. The reference to Jones et al. (1998) is not as helpful as might be hoped. The correlations reported by Barnett et al. (1999) and

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Jones et al. (1998) differ in most cases, and 4 of the 21 records used by Barnett et al. are not documented by Jones et al. . The set of records that they use is one in which ice cores and corals, with their particularly weak temperature signals and dating uncertainties, are more strongly represented than in any of the rigorous reconstructions reported in the last two or three years. However, Barnett et al.'s *(op.cit.*) inability to identify a strong local temperature signal in some of the proxies they select is almost irrelevant to the detection and attribution problem at hand. The authors imply that this is a fundamental limitation to the use of paleoclimatic data in large-scale temperature reconstructions. This is not so. Several studies (e.g., Bradley, 1996; Mann et al, 1998a; Evans et al., 1998) have shown that the available network of proxy climate records is more than adequate to reconstruct the principal patterns of climate variability. These studies have pointed out that the main issue is whether or not a particular distribution of data is adequate to sample the key *patterns* of climate variability on interannual and longer timescales (associated, for example, with ENSO, the NAO, and various decadal and multidecadal patterns of intrinsic climate variability; cf. Kelly et al., 1999). Proxies that may be unrelated to local *temperature* may nonetheless capture some of the variance of the large scale climate system as a result of their relationship to another local climate factor or set of factors. Consider, for example, the drought-sensitive tree ring latewood width chronologies from Mexico and the southwestern U.S. (Stahle et al, 1998) which show very strong (and statistically significant) correlations with the Southern Oscillation Index, an index that characterizes a phenomenon of global significance. Similarly, trees that are sensitive to drought in Morocco (Stockton and Glueck, 1999) appear to be effective indicators of the

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North Atlantic Oscillation, a primary mode of extra-tropical cold-season temperature variability. Correlating such records against local instrumental temperature data is not a useful assessment of their potential usefulness in large-scale temperature pattern reconstruction. Barnett et al. (1999) confuse the issue of the usefulness of a proxy record in calibrating a local temperature signal, and the potential usefulness of the same record in calibrating a large-scale pattern of climate variability. Indeed, the two are often largely uncorrelated (see the discussion in Mann et al, 1998b).

2. The statement that "only a few of the tree-ring records from mid to high-latitude sites can be interpreted directly as temperature changes" is factually incorrect; the authors overlook several decades of dendroclimatological research which demonstrates otherwise (e.g. Briffa et al, 1988a, 1990; Graybill and Shiyatov, 1992; Hughes et al., 1999; Jacoby and Cook, 1981; Vaganov et al., 1996). There is a body of careful work, in which the difficulties of using natural archives are addressed explicitly (for example, Briffa et al., 1998; Vaganov et al, 1999). More preposterous still is the notion that there is such a thing as a small handful of "good records" that should be used to reconstruct hemispheric temperatures. This argument is not based on any rigorous statistical considerations, but rather a flawed preconception about the means by which optimal pattern reconstructions are obtained. More careful considerations of optimal proxy networks, which take into account the covariance structure of the instrumental and proxy observations, are available in the literature (Bradley 1996; Cook et al., 1999, Evans et al, 1998; Fritts, 1991, Mann et al, 1998a). As discussed above, non-temperature related proxies may sometimes be more

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vital in this problem than temperature-related proxies. When the proxy data sets have been limited to records with strong, clear, local or regional temperature signal, valuable reconstructions on continental to hemispheric scales have been established (e.g. Briffa et al., 1988b; Briffa and Osborne, 1999), but they are largely limited to high latitudes.

3. The statement "The disparity between these reconstructions at some times over the last 400 years is *as large* as the observed changes in global temperature over the last 100 years" [in reference to the comparison shown in their Figure 2 between the hemispheric temperature estimates of Mann et al (1998a), Briffa et al (1998a), and Jones et al (1998)] is incorrect. The maximum discrepancy during the 400 year interval shown is 0.45ºC, between the Briffa et al (1998) and Jones et al (1998) estimates around 1840. In contrast, the mean 20th century warming indicated by the smoothed instrumental record is approximately 0.8ºC. In fact, by appropriate measures, the proxy reconstructions of hemispheric mean temperature are more similar to some of the model simulations in terms of the amplitude of estimated internal variability, than the models are to each other. Crowley and Kim (1999), using an energy balance model, estimate that as much as 18-34% of low frequency variability in proxy-based hemispheric temperature reconstructions over the pre-anthropogenic interval could be forced by volcanism and solar variability. Most importantly, they show that the spectrum of the residuals (i.e. the remaining component when this forced variability is accounted for) agrees with that of unforced variability from control runs of coupled models at the 90% significance level.

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4. The claim that the disparity between the three reconstructions shown in Figure 2 is largely due to intrinsic uncertainties in our ability to estimate hemispheric mean temperature ignores evidence to the contrary. A large part of the difference between the Mann et al (1998a) and Jones et al. (1998) reconstruction, for example, is to be expected, because the reconstructions were designed to cover different regions and seasons (Mann et al., 2000). The Jones et al estimate is calibrated as an indicator of extratropical summer temperatures, while the Mann et al 1998a (and 1999) series is calibrated as a Northern Hemisphere and annual-mean estimate. Other series, such as the Overpeck et al (1997) estimate, are based on a yet different, high-latitude summer sampling emphasis. These seasonal and latitudinal sampling issues appear to be the primary reason for differences between the estimates. If the Mann et al. pattern reconstructions are sampled in a similar extra-tropical latitude band (30-70°N), the two reconstructions lie well within the self-consistently estimated uncertainties of Mann et al (1998a). Furthermore a more recent version of the Briffa et al. (1998) series, using more conservative standardization techniques (Briffa and Osborn in press) is far more similar to the Mann et al. (1998a) series than their earlier study reported.

5. Barnett et al.'s statement that it is "debatable whether there is enough temperature proxy data to be representative of hemispheric, let alone global climate changes given…lack of large spatial coherence in the data" is incorrect on at least two counts.

a) The ability to skillfully reconstruct northern hemisphere mean temperature with such data has been rigorously demonstrated with careful cross-validation exercises by Mann et

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al (1998a; 1999) using independent large-scale temperature measurements from the 19th century, and the sparse available measurements several centuries back in time in Europe and North America, to test the pattern reconstructions.

b) Highly significant coherence in these data has been clearly demonstrated; Mann et al. (1995) showed that interdecadal (15-35 year) and multidecadal (50-100 year) frequency-bands exhibit clearly enhanced amplitude climate variability in global proxy data during the past 5 centuries, even relative to the null hypothesis of spatially-correlated colored climatic noise.

Finally, we believe that relying on computer models to estimate the actual low-frequency variability of the climate without the validated ability to model century and longer timescale variability is decidedly unwise. Despite the comments of Barnett et al (1999), it is self-evident that global climate models cannot now, or in the foreseeable future, be relied upon to give a definitive description of the natural variability of the true climate system. *Models cannot estimate variability associated with processes or feedbacks that are not present in the models themselves*. The potential non-linearities of small-scale processes that are not resolved, dynamical feedbacks which are not accurately represented (cf. Cane et al, 1997), and numerous potential surprises regarding the true global climate system (e.g., the role of gas hydrates) will probably always limit the ability of models to accurately represent the true system. The arguments of Barnett et al. fly in the face of some of the most basic tenets of natural science, whereby the real-word truth must always be the target for our theoretical models. In the control integrations that Barnett et al suggest we should rely upon to estimate natural variability,

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most of the very factors that may have led to that variability are missing. For example, there is absolutely no representation of long-term changes in solar irradiance forcing, volcanic forcing, astronomical variations, land use changes and other factors which may influence climate on decadal to millennial timescales. Without a consideration of such effects, model-based estimates of "natural variability" must necessarily be very imperfect approximations to reality.

In contrast to the conclusion of Barnett et al., we argue that, in fact, paleo data offer the best and *only* hope of validating the low-frequency behavior of models. They add a critical element to the detection and attribution problem that will never be possible from a comparison of 20th century model simulations and instrumental observations alone. The paleo data allow us to look at potential forcing mechanisms prior to the era of anthropogenic forcing, potentially validating or testing model-based estimates of climate sensitivity.

In summary, Barnett et al. (1999) completely undervalue the role of paleoclimatic data in assessing and documenting climate variability. The utility of these data is not limited to the study of past fluctuations in seasonal or annual temperature, but extends to precipitation, circulation patterns, the past behavior of the oceans and of the cryosphere, and several important forcing factors such as atmospheric composition, solar receipts and volcanic eruptions (Alverson et al., 2000; Bradley, 1999). Models are useful tools to understand the complexities of past and future climate variations, but they are no substitute for reality. We would delude ourselves if we were to think that models alone can tell us more about climate system variability than natural archives of past climate.

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We agree with Barnett et al. when they assert that proxy records are 'our only means to determine levels of natural variability over the last 1000 or so years from real data' (page 2652, *op.cit.*).

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>and numerous potential surprises regarding the true global climate system
>(e.g., the role of gas hydrates) will likely always limit the ability of
>models to accurately represent the true system.
>
>Same paragraph:
>
>In the control integrations that Barnett et al suggest we rely upon to
>estimate natural variability
>
>change to:
>
>In the control integrations that Barnett et al suggest we should rely upon
>to estimate natural variability..
>
>Last sentence of the same pargraph:
>
>. Without a consideration of such effects, how meaningful can model-based
>estimates of "natural variability" really be?
>
>You shouldn't ask the question, because the exercise can be meaningful, in
>the sense that it will be a "useful" exercise.
>
>You should state that, "Without a consideration of such effects, model
>estimates of natural variability will always come up short of reproducing
>"reality."
>
>You also have to be careful you don't open a line of riposte. In the
>paragraph:
>
>.. " In fact, model experiments with various forcings have shown close
>similarities between empirically estimated and modeled variations. Mann et
>al (1998a) estimate a sensitivity to solar irradiance forcing of ~0.4W m-2
>from the relationship between their hemispheric temperature reconstruction
>and the Lean et al (1995) solar irradiance reconstruction. This estimate is
>nearly identical to that estimated in the modeling study of Cubasch et al.
>(1997). Furthermore, Waple et al. (2000) show that the empirical patterns
>of sensitivity to estimated solar-irradiance variations during the
>pre-anthropogenic interval 1650-1850 are remarkably similar to the
>model-estimated pattern of Cubasch et al. (1997) both in terms of global
>mean sensitivity, and the underlying spatial pattern"
>
>Remember that a modeling study "sensitivity" is not the same as measuring
>the "true" sensitivity of the global climate to solar irradiance
>variations--those can only be ascertained by measurement--say of the solar
>output and the earth's tempeature from properly and long-term calibrated
>satellite measurements. A model number depends on the parameter values
>specified apriori--you get a number back that is commensurate with the
>explicitly coded mathematics. I'm not sure that what you said above is
>totally germain to your argument.
>
>Finally:
>
>"Crowley and Kim (1999) have shown that when estimates of naturally-forced
>variability are removed from the proxy estimates, the residual variability
>is quite similar in its spectrum to the low-frequency variability of the
>models, in fact as similar as the different models are to each other!"
>
>This last sentence is imporant, but it's a bit opaque. Rephrase perhaps?
>
>

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>Cheers, Henry
>
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>http://www.geo.umass.edu/climate/paleo/html
>

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From: Malcolm Hughes
To: Michael E. Mann
Cc: rbradley@geo.umass.edu; mann@virginia.edu
Subject: Re: Globe
Date: Wednesday, May 21, 2003 7:03:19 AM

Mike - of course not. He did not have me say anything I did not, but he omitted my central point - that Soon et al did not apply these essential standards but rather compared centuries with decades, material with poor chronology, uncalibrated against present, and so on. This is, of course, the usual thing to be expected from journalists. Cheers, Malcolm

> Kevin, Malcolm:
>
> This piece appeared in the globe yesterday:
> http://www.boston.com/dailyglobe2/140/science/Coaxing_nature_to_reveal

> > _1_000_years _of_the_Earth_s_climate+.shtml
>
> The piece seemed inappropriately uncritical given the emphasis of the
> story on Soon/Baliunas, and I'm wondering if the reporter adequately
> represented your comments and views in the piece,
>
> mike
> _____
> __
> Professor Michael E. Mann
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From: Michael E. Mann
To: Tom Wigley; Phil Jones; Keith Briffa; Michael Oppenheimer; Raymond Bradley; Malcolm Hughes; Jonathan Overpeck; Kevin Trenberth; Tom Crowley; Ben Santer; Steve Schneider; Caspar Ammann
Subject: Re: letter to CR
Date: Thursday, July 31, 2003 8:41:11 AM

Thanks Tom,

Had a chance to look over this briefly, and it looks really good--you raise some good questions, which I'll try to get around to responding to ASAP, after I put other various fires...

I have one concern about submitting this to CR. My own personal feeling is that we have collectively now entered into an implicit boycott of the journal (including submission, reviewing, and perhaps(?) even citing). I think that Von Storch et al's resignation from the editorial board raises the bar, in this regard, now. The best thing is to let this journal waste away into utter disrepute, so that the skeptics can't use it the way they've been trying to...

So if are to submit this piece to CR, we violate any such implicit boycott. Is there another alternative? You've put a lot of work into this, and I'd hate to see the effort wasted. I'm open to suggestions,

mike

At 09:20 AM 7/31/2003 -0600, Tom Wigley wrote:

> Dear all,
>
> I voluntered some time back to write a critique of the Soon and Balliunas paper (which I refer to as BS) to send to CR. I still plan to do this, and hope for your support. I think it is important to have a pointed and specific critique of this work published in the journal in which the original work appeared.
>
> In beginning this task, I went through the paper again carefully. This raised a number of issues in my mind, articulated as questions in the attached Word document. I am not suggesting here that all of these issues be raised in any critique. Rather, answers from you to the various questions will help me in formulating a critique that I will then bounce off you for improvement.
>
> Thanks for your help,
>
> Tom.

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From: Michael E. Mann
To: Keith Briffa; Tom Wigley; Phil Jones; Michael Oppenheimer; Raymond Bradley; Malcolm Hughes; Jonathan Overpeck; Kevin Trenberth; Tom Crowley; Ben Santer; Steve Schneider; Caspar Ammann
Subject: Re: letter to CR
Date: Thursday, July 31, 2003 9:18:29 AM

Dear all,

I'm open to Keith's suggestion. Submission to CR, w/ Holocene as a backup plan, might be a reasonable way to do. Will provide some answers to Tom's inquiries which I expect will be complimentary to Keith's comments...

I share Keith's concern also about keeping Ed Cook too much outside the loop. He is, by necessity, a player in all of this...

Perhaps Keith, who knows him best, might contact Ed and see what his feelings are about potentially becoming constructively involved with this effort (Keith?)...

mike

At 05:02 PM 7/31/2003 +0100, Keith Briffa wrote:

> Tom et al.
> I am glad you are still prepared to do this. I think it is important that a dispassionate , more-detailed critique of the paper is published . The EOS letter was a position statement , kept brief so as not to dilute the message.
> I have to leave work now but will respond tomorrow to some of your points , obviously including some comments on the tree-ring questions. However, in response to Mike's comments re the target journal - I still favour a submission to CR , as the publisher of the original piece. The fact that it may be "rejected out of hand" is good in my opinion and merely serves to emphasize to the neutral , the bias in the editorial regime there. Of course **The Holocene** , would then be glad to consider the rejected paper in such an event.
> I am also forwarding your questions directly to Ed , as it would be inappropriate to comment without keeping him in the loop, and a waste not to seek his response about the Esper et al paper and wider tree-ring questions , at least.
> best wishes
> Keith
>
> At 11:40 AM 7/31/03 -0400, Michael E. Mann wrote:
>
> > Thanks Tom,
> >
> > Had a chance to look over this briefly, and it looks really good--you raise some good questions, which I'll try to get around to responding to ASAP, after I put other various fires...
> >
> > I have one concern about submitting this to CR. My own personal feeling is that we have collectively now entered into an implicit boycott of the journal (including submission, reviewing, and perhaps(?) even citing). I think that Von Storch et al's resignation from the editorial board raises the bar, in this regard, now. The best thing is to let this journal waste away into utter disrepute, so that the skeptics can't use it the way they've been trying to...
> >
> > So if are to submit this piece to CR, we violate any such implicit boycott. Is there another alternative? You've put a lot of work into this, and I'd hate to see the effort wasted. I'm open to suggestions,
> >
> > mike

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At 09:20 AM 7/31/2003 -0600, Tom Wigley wrote:

> Dear all,
>
> I voluntered some time back to write a critique of the Soon and Balliunas paper (which I refer to as BS) to send to CR. I still plan to do this, and hope for your support. I think it is important to have a pointed and specific critique of this work published in the journal in which the original work appeared.
>
> In beginning this task, I went through the paper again carefully. This raised a number of issues in my mind, articulated as questions in the attached Word document. I am not suggesting here that all of these issues be raised in any critique. Rather, answers from you to the various questions will help me in formulating a critique that I will then bounce off you for improvement.
>
> Thanks for your help,
>
> Tom.

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---

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--

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From: Michael E. Mann
To: Tim Osborn; Malcolm Hughes; Keith Briffa; Kevin Trenberth
Cc: Caspar Ammann; rbradley@geo.umass.edu; tcrowley@duke.edu; omichael@princeton.edu; jto@u.arizona.edu; Scott Rutherford; Tom Wigley; p.jones@uea.ac.uk; mann@virginia.edu
Subject: Re: draft
Date: Tuesday, October 14, 2003 6:31:09 AM
Attachments: SoonReply.doc

Thanks Tim and Malcolm,

The latest round of suggestions were extremely helpful. I've accepted them w/ a few minor tweaks (attached). We're at 765 words--I think AGU will let us get away w/ that...

So, comments from others?

Thanks,

mike

At 02:11 PM 10/14/2003 +0100, Tim Osborn wrote:

> SO3 argue that borehole data provide a conflicting view of past temperature histories. To the contrary, the borehole estimates for recent centuries shown in M03 may be consistent with other estimates, provided consideration is given to statistical uncertainties, spatial sampling and possible influences on the ground surface [e.g., snow cover changes--Beltrami and Kellman, 2003]. It is not meaningful to compare the late 20th century with a much longer period 1000 years ago [Bradley et al., 2003], especially given the acknowledged limitations [Pollack et al., 1998] of borehole data.

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Soon and colleagues ('S03') fail to address any of the three specific issues we raised in our *Eos* criticism ('M03') of their previous work ('SB03'). These were the need for critical evaluation of proxy data to be used; consistent assimilation of widespread, well dated and resolved records, and the objective, quantitative calibration of these records [see also *Bradley et al*, 2003]. S03, instead, start with the implausible claim that we agree with their assertion "knowledge of past climatic changes does not have a direct bearing on the climatic effects of anthropogenic carbon dioxide...". Reconstructions of past temperature histories do, indeed, have such a bearing. They provide one of several independent lines of evidence supporting the consensus scientific conclusion expressed in the 2001 report of the *Intergovernmental Panel on Climate Change* (IPCC) that anomalous hemispheric late 20th century warmth cannot be explained by natural factors. S03 follow with an equally puzzling assertion that "*M03 relies mainly on a Northern Hemisphere reconstruction of average annual temperature by Mann et al. [1999*]". Our article, quite to the contrary, demonstrated that nearly a dozen different published estimates based on proxy data and model simulations give the same picture--anomalous late 20th century warmth that is unprecedented in a millennial or longer context.

These straw man arguments set the tone for the ensuing list of myths and discredited claims. Ironically, many of the criticisms raised might better be applied to the ill-conceived, largely subjective approach taken by SB03. While the claims made by S03 are too numerous to address each in detail, several are so at variance with the accepted science that they deserve special attention:

1) The contention that the conclusions expressed by M03 for the period prior to AD 1400 rely mainly "*on tree growth from one region*" belies the fact that several of the proxy estimates shown were based on composites of estimates from regions across the Northern Hemisphere, some based primarily on non-tree ring proxy sources. The claims of S03 regarding non-climatic impacts on tree growth, even if valid, would thus be irrelevant. Nonetheless, the claims aren't valid. Their assertion that *"[20th century]tree growth indices...show declining patterns of tree growth, despite rising temperatures*" is misleading. Declines in the response of tree-growth to temperature are found in certain high-latitude regions only. In such cases, relatively recent (i.e. post 1950) data are not used in calibrating temperature reconstructions. In many other (even high-latitude) areas density or ring-width records display no such bias.

2) The statement by S03 that the *Mann and Jones* [2003] reconstruction "*clearly shows temperatures in the MWP that are as high as those in the 20th century*" is misleading if not false. *Mann and Jones* emphasize conclusions for the Northern Hemisphere, noting that those for the Southern Hemisphere (and globe), are indeterminate due to a paucity of southern hemisphere data. For the Northern Hemisphere, *late 20th* century warmth clearly is shown by *Mann and Jones* to be anomalous in a long-term (nearly two millennium) context, consistent with the conclusions of M03.

3) SO3 argue that borehole data provide a conflicting view of past temperature histories. To the contrary, the borehole estimates for recent centuries shown in M03 are potentially consistent with other estimates, provided consideration is given to statistical uncertainties, spatial sampling and possible influences on the ground surface [e.g., snow cover changes--*Beltrami and Kellman*, 2003]. It is not meaningful to compare the late 20th century with much lower (millennial) resolution borehole information 1000 years ago, especially given the acknowledged limitations of borehole data beyond the past five centuries [*Pollack et al*, 1998].

4) They promote the myth that "urban heat island" effects lead to significant biases in the instrumental record of surface temperature used to calibrate proxy data. A recent case study of modern urban thermometer measurements in the U.S. [*Peterson*, 2003] supports previous findings that the influence of urban heat bias on estimates of global surface temperature change is minimal [*Hansen* et al, 1999].

5) In contrast to their claims, land use changes are believed to have led to an overall cooling, not a warming, of global surface temperatures during the 19th and 20th century [*Govindasamy* et al, 2001].

Articles in *Scientific American* and the *Chronicle of Higher Education*, have quoted numerous other leading climate scientists as indicating that SB03 misrepresented not just mainstream scientific opinion, but the results of their own individual research. The controversy over the publication of SB03 has now led, since the publication of M03, to the resignation of the editor-in-chief and five other editors at the journal "*Climate Research*". We believe that these developments speak for themselves.

Author Affiliations

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Raymond Bradley, Dept. of Geosciences, University of Massachusetts, Amherst, MA.
Keith Briffa, Philip Jones, Timothy Osborn, Climatic Research Unit, University of East Anglia, Norwich, UK.

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Thomas Crowley, Nicholas School of the Environment and Earth Science, Duke University, Durham, NC.
Malcolm Hughes, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ.
Michael Oppenheimer, Princeton University, Princeton, NJ.
Jonathan Overpeck, Dept. of Geosciences and Institute for the Study of Planet Earth, University of Arizona, Tucson, AZ.
Scott Rutherford, Roger Williams University, Bristol, RI.
Kevin Trenberth, NCAR, Boulder, CO.
Tom Wigley, NCAR, Boulder, CO.

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Beltrami, H.., Kellman, L., An examination of short- and long-term air-ground temperature coupling, *Global and Planetary Change*, *38*, 291-303, 2003.

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From: Michael E. Mann
To: Michael Oppenheimer
Cc: Phil Jones; Ray Bradley; Malcolm Hughes; Mike MacCracken; Steve Schneider; tom crowley; Tom Wigley; Jonathan Overpeck; asocci@cox.net; Keith Briffa; Tim Osborn; Tim_Profeta@lieberman.senate.gov; Ben Santer; Gabi Hegerl; Ellen Mosley-Thompson; Lonnie G. Thompson; Kevin Trenberth; mann@virginia.edu
Subject: Re: CONFIDENTIAL Fwd:
Date: Monday, October 27, 2003 8:05:09 AM

Thanks Michael,

I recognize and heed the wisdom in these words. This sentiment come across loud and clear in both yours and others comments. I'm trying to do the "bare minimum" in providing others w/ the ammunition to fight the disinformation effort, if necessary, walking that fine light between making sure that any spurious claims are addressed, but not allowing myself to get into the fray.

I'll just hang back for a while and see how this plays out...

Thanks again for the help and useful advice,

mike

At 09:52 AM 10/27/2003 -0500, Michael Oppenheimer wrote:

> Mike:
>
> From my point of view, the critical thing now is that you NOT spend too much time or psychological energy on this stuff. I know that's a tall order, but it could effectively take you away from your real business for much too long, and potentially exact an even higher price upon you. Your decision to let others do the heavy lifting to the extent that's feasible is wise. Also, at this point, it is unlikely that the vote would be affected later this week by these goings-on. All this sounds very familiar, reeking of what happened to Ben. Their real objective is to neutralize you by dragging you into time-consuming and eventually fruitless fighting, and to send a message to other scientists who might be tempted to enter the public arena.
>
> Michael
>
> "Michael E. Mann" wrote:
>
> > Thanks Phil,
> >
> > I guess we just have to wait and see what happens w/ this,
> >
> > mike
> >
> > At 01:50 PM 10/27/2003 +0000, Phil Jones wrote:
> >
> > Mike,
> > Steve McIntyre is the person who asked me for the series he couldn't get from the M+J
> > article. Told him I couldn't send them - back in August. He's sent emails to the Finn (Timo)
> > saying some of the series weren't available, blaming us for using data that aren't readily
> > available.
> > Some years ago I sent him loads of temperature stations and discussed homogeneity issues,
> > but never heard anything else.
> > From my recollection of the emails I suspect the article isn't likely to be up to much.
> >
> > Cheers
> > Phil
> >
> > At 08:35 27/10/2003 -0500, Michael E. Mann wrote:
> >
> > > Thanks Phil,
> > >
> > > Got your email just as I sent off my latest.
> > >
> > > I agree fully with what you say--it is very difficult to repeat such an analysis exactly, and the real point here is, who knows what this guy (Steven McIntyre--I don't know who the supposed 2nd author is) actually did. The Mann et al '99 paper was clear that the results were sensitive to a small number of skillful predictors prior to AD 1400, and that non-climate biases had to be corrected for in some of the longer series to get

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a skillfully cross-validated reconstruction! Without knowing what the guy did, I'm guessing that he doesn't even demonstrate that his alternative "reconstruction" passes cross-validation. If not, its all moot...

But more fundamentally, this wasn't submitted to a legitimate peer-reviewed scientific journal. Its a social science journal, and one that has shown a disdain for peer review (e.g. in publishing the Soon et al Climate Research paper essentially in its original unedited form--and see the recent documented comments of the editor).

I agree this might blow over, but the folks in DC, such as McCain and Lieberman, who are fighting to represent what the legitimate scientific community has to say, need to be prepared in case the special interests try to use this. Hence, the short response I sent out.

cheers,

mike

At 01:23 PM 10/27/2003 +0000, Phil Jones wrote:

> Mike,
> Depending exactly on what it says I suggest we should do our best to ignore it. E&E is
> edited (a very loose use of the word) by Sonia Boehmer-Christiansen, who's generally
> involved, in some way, in all skeptic stuff here in Britain.
> It is rather odd that the email said the two had rerun his (Mann's) exact analysis and got
> quite different results. I know I couldn't do this, as when Keith, Tim and me wanted to do
> some comparisons with MBH98 a few years ago a few of the series could not be made
> available. I'm not trying to make any sort of point here, just to state that repeating an
> analysis with exactly the same data is normally very difficult. Missing values is an odd
> phrase also, as all the series used are complete from first to last year. If it isn't MBH98/99
> then for M+J03 in GRL, there at least three series that are not available for use, without
> contacting the authors of the original papers.
>
> So let's wait to see what it says. Suggested response would seem follow response 2.
>
> Cheers
> Phil
>
> At 13:47 26/10/2003 -0500, Michael E. Mann wrote:
>
>> Dear All,
>>
>> This has been passed along to me by someone whose identity will remain in confidence.
>>
>> Who knows what trickery has been pulled or selective use of data made. Its clear that "Energy and Environment" is being run by the baddies--only a shill for industry would have republished the original Soon and Baliunas paper as submitted to "Climate Research" without even editing it. Now apparently they're at it again...
>>
>> My suggested response is:
>>
>> 1) to dismiss this as stunt, appearing in a so-called "journal" which is already known to have defied standard practices of peer-review. It is clear, for example, that nobody we know has been asked to "review" this so-called paper
>>
>> 2) to point out the claim is nonsense since the same basic result has been obtained by numerous

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other researchers, using different data, elementary compositing techniques, etc.

Who knows what sleight of hand the authors of this thing have pulled. Of course, the usual suspects are going to try to peddle this crap. The important thing is to deny that this has any intellectual credibility whatsoever and, if contacted by any media, to dismiss this for the stunt that it is..

Thanks for your help,

mike

two people have a forthcoming 'Energy & Environment' paper that's being unveiled tomoro (monday) that -- in the words of one Cato / Marshall / CEI type -- "will claim that Mann arbitrarily ignored paleo data within his own record and substituted other data for missing values that dramatically affected his results.

When his exact analysis is rerun with all the data and with no data substitutions, two very large warming spikes will appear that are greater than the 20th century.

Personally, I'd offer that this was known by most people who understand Mann's methodology: it can be quite sensitive to the input data in the early centuries. Anyway, there's going to be a lot of noise on this one, and knowing Mann's very hin skin I am afraid he will react strongly, unless he has learned (as I hope he has) from the past...."

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From: Michael E. Mann
To: Edward Cook
Cc: Michael E. Mann; jto@u.arizona.edu; mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu; tcrowley@nc.rr.com; Jan Esper; srutherford@gso.uri.edu; drdendro@ldeo.columbia.edu
Subject: Re: Esper/Cook paper
Date: Thursday, September 06, 2001 11:01:08 AM

Hi Ed,

Fair enough on all points. Actually, I think the models *do* demonstrate the differeence between true hemispheric mean and extratropical mean in question, and this is something Scott Rutherford and I will be describing in a publication to come out shortly....

As for the trpoical records, you are right, only a few before 1600--but there are a dozen or so for the past several centuries, and some of the most significant differences between our reconstrucitons are during the "Little Ice Age"--during that period, we have adequate tropical representation given, again, the standard correlation length arguments...

cheers,

mike

At 01:55 PM 9/6/01 -0400, Edward Cook wrote:
>Hi Mike,
>
>Honest differences of opinion are good for science because they often spawn
>good research to sort out the differences. So, I will briefly respond to
>your reiterations.
>
> >HI Ed,
> >
> >Thanks for your responses, which are reasonable.
> >
> >We do maintain some significant honest differences of opinion on a few
> >matters, which I've reiterated below:
> >
> >1) I think the 19th century instrumental record is a whole lot better than
> >you give credit, and certainly is more trustworthy than even the best proxy
> >records. It'll take a *very* convincing argument to favor proxy data over
> >the 19th century instrumental record.
>
>I agree that instrumental data is better in general and I freely admit that
>I am probably wrong here. However, I just worry about the imprecise
>(inaccurate?) methods used to correct for time of observation bias and
>shelter/exposure changes before max-min thermometers and Stephenson screens
>became standard. These corrections could introduce a systematic bias.
>
> >
> >2) The correlations you cite still sound odd to me. What is the nature of
> >the highpass (what timescales are retained)? I would expect the interannual
> >correlation to be much smaller since ENSOs and the NAO have an almost
> >exclusively cold-season influence which expresses itself in the annual
> >calender mean but not the warm-season mean. Scott has computed these series
> >from our infilled Jones data and perhaps can compare with our own
> >calculations (Scott?). There may also be an important distinction between
> >the extratropical and tropical behavior in this case.

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>I am using data directly from Phil's grid. The 0-90N comes from the CRU web
>site and the 30-70N data come from Tim Osborn at CRU who pulled off that
>zonal average for me. So, I am simply reporting what I have calculated from
>those data sets. The filter is approximately a 15yr hp using 10% lowess
>smoothing to provide the lp. This I admit is crude, but I seriously doubt
>that it will differ much if I use a proper digital filter. The lowess
>smoother preserves phase pretty well. However, I am going to do it again
>with a proper digital filter to convince myself and you(?) that the
>correlations are correct. I will let you know in a bit.
>
> >
> >3) The difference in amplitude and behavior of the tropics vs. the
> >extratropics is *real* and quite evident in the instrumental record. There
> >are a number of extratropical processes (e.g. the NAO) which have little
> >tropical influence, and little influence on the full Northern Hemisphere.
> >The NAO, for example, has a correlation of r=0.35 or so w/ extratropical
> >Northern Hemisphere winter temperature, but only r=0.09 with annual mean
> >full (0-90N) Northern Hemisphere temperature. Clearly there is a big
> >difference in the behavior of extatropical vs. tropical northern hemisphere
> >temperature.
>
>I agree with you here on the amplitude issue. That is a given. However, I
>don't believe that your argument is sufficient to explain the differences
>between our multi-centennial trends. Necessary perhaps, but not sufficient
>because it doesn't explain how such large multi-centennial differences
>arose. What do the coupled models say about this issue? Is there the same
>level of disagreement at multi-centennial timescales between zonally
>averaged temperatures in the tropics and extratropics in 1000 year model
>runs?
>
> >
> >4) Regarding your correlation scale argument, if 14 tree ring series are
> >good enough to capture the entire Northern Hemisphere extratropics, why
> >don't you believe that our more than a dozen tropical proxies can capture
> >the tropical band (wherein the correlation scale of temperature variability
> >is actually less!). Our own experiments w/ the Jones record and model data
> >(unpublished) suggest such a sampling should be more than adequate!
>
>Fair point to a point, although I don't believe that I said that the 14
>series capture the "entire" NH extratropics. If I did, point it out to me
>and I will correct it. I guess I am thinking in terms of coverage of the
>past millennium, which is impossible on an annually resolved basis from
>tropical proxies. Once you get before AD 1600, what tropical series are
>still in your estimates? Only Quelccaya according to your list of proxies.
>
> >
> >5) Re, high-elevation temperature sensitive chronologies in the western
> >U.S. and co2 fertilization, I'll leave you and Malcolm to debate that one...
>
>I am happy to debate this issue with anyone. The evidence for a direct CO2
>fertilization effect in tree rings is extremely weak and almost wholly
>circumstantial. Matching trends does not a causal mechanism make. A
>concomitant trend exists for N deposition as well, I suspect.
>
>These debates are fun, even if they don't necessarily lead to closure.
>
>Cheers,
>
>Ed

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>
>==========
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From: Michael E. Mann
To: Malcolm Hughes
Cc: Edward Cook; Michael E. Mann; Crowley_Hegerl; jto@u.arizona.edu; mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu; tcrowley@nc.rr.com; Jan Esper; srutherford@gso.uri.edu
Subject: Re: Esper/Cook paper
Date: Thursday, September 06, 2001 3:23:25 PM

Malcolm--thanks for clarifying: The co2 fertilization argument is somewhat speculative, but what is significant is that there does appear to be a non-temperature component to growth that emerges in some of the high-elevation chronologies in the early 19th century (and that is what we attempted to remove in MBH99); so it would be interesting to hear if there is evidence for that in these chronologies...

mike
At 03:38 PM 9/6/01 -0700, Malcolm Hughes wrote:
>Dear Ed et al,
>This is a fascinating discussion, which I'm only able to skim over
>quickly until (I hope) I get a bit of time this weekend to read the mss
>carefully. One point that did come up in the discussion should,
>however, be cleared up quickly, namely the change in behavior of
>some of the long tree-ring records in Western North America about
>150 years ago. Ed is quite right that we do not know what caused this
>- I do think that some variant of direct carbon dioxide fertilization may
>have played a part, but as he said so might some other factors. In any
>case we don't know. I think that the formulation used in MBH99 - the
>GRL paper - is the best one for the time being, namely: "For our
>purposes, however, it suffices that we consider the residual [between
>the 1st PC of ITRDB N. American data and the Jacoby/D'Arrigo
>N.American dendroclimatic series] to be non-climatic in nature...".
>So, the relevant point here is whether there is evidence for any such
>century-scale non-climate related change in the last 150 years in the
>materials Ed and Jan have used - did you compare them with their
>regional temperatires?.
>I do note that when Henry Diaz and I (Hughes and Diaz, 1994)
>compared several long tree-ring reconstructions from around the
>world with instrumental temperature records (of course a correlation
>with annual values of seasonal temperatures) the reconstructions from
>the Sierra Nevada (both Lisa Graumlich's and Don Graybill's) came
>out worse than the Polar Urals, Tornetrask, and Rio Alerce from
>South America, and about the same as Tasmania.
>More later, Malcolm
>Malcolm Hughes
>Professor of Dendrochronology
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From: Michael E. Mann
To: Edward Cook
Cc: Scott Rutherford; mhughes@ltrr.arizona.edu; rbradley@geo.umass.edu
Subject: Re: Esper et al paper
Date: Friday, March 22, 2002 1:34:57 PM

Ed,

I'm assuming you don't have any problem in making the 14 series used by Esper et al available to us in our next round of hemispheric temperature reconstructions, (which Scott is in the process of doing)? Thanks in advance for your help,

mike

At 05:29 PM 3/21/02 -0500, you wrote:

> Hi Mike,
>
> Obviously, I am sorry that you found the revised paper wanting and in some sense unfair. That of course was never the intention of the paper. The changes in the paper were due in part to the reviewers' comments and in part to the large degree of editing and reduction that was required by Science. In that case, I tried (apparently without success in your view) to maintain the same thrust of the paper as before. I thought that I did a reasonable job in that regard. Perhaps I should have passed it by you again, but I was out the door for more fieldwork shortly after the revision was due back to Science. I certainly apologize if you feel that this was unfair. There was never any intent on my part for this to be the case.
>
> Thanks for the telephone call as well. I really do enjoy working with you and don't want to jeopardize any future collaboration between us.
>
> Regards,
>
> Ed
>
> > Dear Ed,
> >
> > I'm really sorry I couldn't be more supportive of the final version of the manuscript. I fully expected to be able to be more positive in my assessment. I was frankly very disappointed when I saw the final version--it is overwhelmingly different from the version you shared with us originally. Sadly, it seems to have suffered, and not benefited, from the review process--a very odd scenario. I fault the reviewers as much (in fact more) that I fault you for this. There are some really basic problems that they didn't seem to catch. I hope neither you nor your co-authors take this personally.
> >
> > I'm trying to be as diplomatic as I can be in my discussions w/ reporters, etc. but I really wish you hadn't sprung this on us w/ no warning of the dramatic changes that were made. I'm forced to be somewhat critical, because the flaws in some of your conclusions need to be pointed out, or they will be exploited by those w/ alterior motives. You certainly must have foreseen this, as must have the reviewers. I'm very disappointed, very disappointed indeed.
> >
> > I'm sharing my comments w/ Keith, Phil, Tim, Tom, Ray, and Malcolm. I am resisting the temptation to write a letter of response to *Science*, although my better judgement dictates that I should...

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Mike

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Attachment converted: Macintosh HD:treerings-comments.doc (WDBN/MSWD) (0008C7BF)

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From: Michael E. Mann
To: Raymond S. Bradley; mann@multiproxy.evsc.virginia.edu
Cc: mhughes@ltrr.arizona.edu
Subject: Re: Nature letter
Date: Friday, July 21, 2000 1:29:47 PM

HI Ray,

Well, there is no time in the forseeable future where I can do any additional analyses. W/ everything else going on (including 2 courses to prepare for Fall), Scott Rutherford is really carrying the load, and is busy w/ other analyses right now. Eventually, we will be able to sysematically address all of this in more detail when scott gets around to doing the analyses using the expanded data from Malcolm (and any you have to provide).

The analysis I did was simply to show that the warming *does* persist in our reconstructions based on the data we used in our previous publications, through the 1990s. This contradicts claims that proxies show cooling over that period of time. I feel that we protect ourselves by stressing the fact that the very sparse data necessarily undercalibrate the variance and trend in the calibration period, so it isn't suprising they do so during the post-calibration period. The skeptics will always mis-represent what we've done, so that can't be our standard. The point is that the skeptics get more marginalized each time, because when a reporter cites a criticism of theirs, we can directly counteract it from published, peer-reviewed science. This is yet another case where we will be able to prevent them from making the spurious claim that proxies don't show warming after 1980.

Anyways, lets wait for Malcolm's comments on this. I would prefer to have you as a co-author on this, but I am willing to publish this solo if you and Malcolm are not comfortable with it...

Around for 1 more day before leaving for BC...

mike

At 04:13 PM 7/21/00 -0400, Raymond S. Bradley wrote:
>I fear that the revised analysis does not serve the original purpose in
>showing a close [enough] coherence with the instrumental data.....it will
>only provide ammunition to sceptics. You are right in pointing out that
>even this limited data set shows an enhanced rate of warming, but it does
>not do this "well enough" to make a note to Nature worthwhile, in my
>opinion. Sorry to say that, as I know you worked hard on this & are
>excited about the result. But I would say it is better to wait until we
>have a better, updated data set than to publish something that we may later
>have to live down....
>I wonder now if you can re-assess the pre-1400 study by systematically
>eliminating each proxy, one by one, to determine which of these drove the
>early millennial warming (or perhaps reduced it?) vis a vis the other data
>series....? This might provide clues as to the relative signal in the
>Tropics v. extra-tropics, for example....or in the low frequency
>contribution of tree ring data v. ice core....
>Now you're going to tell me we already did this and it was published
>.....OK, so I have a hard time keeping up with the literature!
>What do you think? Maybe let MKH be the arbitrator....
>Ray
>

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>
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>Paleoclimatology Book Web Site (1999):
>http://www.geo.umass.edu/climate/paleo/html
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From: Malcolm Hughes
To: Michael E. Mann
Cc: rbradley@geo.umass.edu
Subject: Re: close call
Date: Monday, July 31, 2000 3:00:26 PM

Dear Mike - I have read and re-read the draft, and have come to the conclusion that it would be a mistake to publish it. I would also urge you not to publish it. I think my enthusiasm aroused by the first version of the figure allowed me to ignore the most important problem. In the 1999 GRL paper the dangers of using too few proxies for a hemispheric reconstruction were rehearsed - that was our intention. That this new version of your post-1980 calculations should be so sensitive to the omission of a single record is very worrying indeed. It should also be noted that nothing much happens in the 'new' reconstruction until the last three years. I fear this would give a wonderful opportunity to those who would discredit the approach we used in MBH 1998 and 1999. They would almost certainly seize it to attack the use of the MBH99 reconstruction in the IPCC.
On reflection, I think it would be much wiser for use to keep our powder dry, and if challenged in a creditable forum point out that we are working on assembling a dense and high quality proxy data set that comes out nearer to present.
When will you next be in Amherst? Cheers, Malcolm

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From: Michael E. Mann
To: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu
Cc: mann@virginia.edu; srutherford@virginia.edu
Subject: borehole paper
Date: Thursday, June 07, 2001 8:41:56 AM

Hi Ray (in Europe) and Malcolm,

Scott and I are finalizing the results of the borehole analysis. They are more surprising than even we expected, and will certainly merit the Nature submission we had talked about.
We expect to have a draft within the next day or two. I will attach this to both of you, w/ figures embedded, as a word97 document.

I think we can now make a concise and convincing argument that Huang et al didn't weight the boreholes appropriately, and, if you do weight the data reasonably (using a number of methods, one as simple as weighting the boreholes by their linear correlation coefficient w/ the instrumental record), you get something much closer to Mann et al (or Jones et al, etc.). We lay out the story pretty nicely, formulating the whole problem as linear regression problem where you can choose the weights borehole data in the simplest, but entirely un-optimal (ie, uniform as in Huang et al) way, or in an increasingly more objectively optimal manner. And as you do this, you get closer and closer to Mann et al. The map of weights also gives us some good insights into the sources of bias in the borehole data. Your feedback on my interpretation here will be very useful...

We also show that the results using Mann et al no-dendro or Mann et al dendro-only give similar century-scale trends, and similar to the properly weighted boreholes. Including this (which is just a couple extra traces in one of the plot panels) should satisfy Malcolm's concern that we get this result out more prominently as well.

Now, I'm not sure we'll want to show any more results than what Scott and I are already planning on showing, though I know Frank has some other interesting results, many of which are probably redundant w/ what we have done (e.g. the gridding scheme). Given
all the work that Frank has put in, I'd like to suggest that we offer him co-authorship on the paper, even if we don't actually use his own analyses per se. I'll leave this to Ray to decide...

A manuscript should be shortly forthcoming. I'm hoping I can then get comments within the next week from both of you. I will be in Amherst from June 15-20th, and Scott and I talked about the possibility of us all (sans Malcolm, unfortunately) meeting at Raos the morning of the 19th to discuss any final revisions of the manuscript.

cheers,

mike

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From: Raymond S. Bradley
To: mann@multiproxy.evsc.virginia.edu; srutherford@virginia.edu; mhughes@ltrr.arizona.edu
Subject: Comments on Borehole paper
Date: Thursday, June 14, 2001 6:28:20 AM
Attachments: borehole01-draft1.1.doc
Untitled attachment 00491.txt

I've gone over the ms and suggested changes using the "Track changes" option in WORD. Hopefully you latex guys can figure this out....

I have a few of concerns:
1) There is no point in showing on Fig 2 any data after 1980, as it's irrelevant. Similarly we should excise this part of any text discussion. The actual median date of the NH borehole logging is (conveniently) 1978.9 (not 1977) so there is no point at all in using data from the last 2 decades. All data should end (or be concatenated back from) 1980.
2) I am concerned that the borehole trend data provide only 2 estimates in the relevant calibration period values for trends in the 1800s and 1900s (or rather two single values, at 1800 and 1900, from which we infer the trends...or was it that H00 extracted the 1800 & 1900 point values from their estimated trends...). How then can we justify a calibration against instrumental data that start in 1856? If one wanted to be awkward, one could argue that the trends 1800-1856 were exactly opposite to those after 1856, confounding this approach...how do we respond to that? Indeed, this is a critical point as we point out the sign of trend differences at many sites in the 19th century, yet we are in a sense comparing apples & oranges.....[of course in our own reconstruction the overall 19th century trend was negative, but that's not just based on the instrumental data....]
3) In the final figure, I do not follow how Jones et al changes so dramatically when calibrated to the 1856-1980 period v. 1900-1980....
4) the point about signal to noise problems in the borehole data, and the residual tiny signal (p.4, para 1) is a crucial one that should be given more prominence. I suggest a figure that simply plots all 400+ borehole trends to illustrate this, or some histograms that show the distribution of trends by century, for all sites.
5) the procedure for gridding the data needs to be explained was it an inverse-distance weighting scheme (which is generally the procedure adopted for the instrumental data). I believe Frank did it this way was that the data set used?

Other changes are in the ms, attached.
Finally, cAN sCOTT SEND ME BETTER COPIES OF figure 2HARD TO DISTINGUISH THE LINES

I look forward to you responses to these points
ray

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Paleoclimatology Book Web Site (1999):
http://www.geo.umass.edu/climate/paleo/html

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RECONCILING BOREHOLE AND PROXY-BASED ESTIMATES OF TEMPERATURE TRENDS IN PAST CENTURIES

Michael E. Mann(1)
Scott Rutherford(1)
Raymond S.Bradley(2)
Malcolm Hughes(3)
Frank Keimig(2)

1. Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22902
2. Department of Geosciences ~~Department~~, University of Massachusetts, Amherst, MA ~~0100~~01003
3. Laboratory of ~~Tree~~ Tree-?Ring Research, University of Arizona, Tucson AZ [zip?]

comments in parentheses [….] are for you to consider

~~Estimated t~~Trends in Northern Hemisphere ground temperature ~~based on~~ estimated from terrestrial borehole temperature profiles (Harris and Chapman, 1997; Pollack et al, 1998; Huang et al, 2000--henceforth "H00"; Harris and Chapman, 2001) ~~have been argued, in previous compilations, to show a greater cooling back in time over the past five~~[I THINK WE NEED TO CHANGE THE CONCEPT OF "COOLING BACK IN TIME" TO "WARMING FORWARD IN TIME"] ~~show much lower temperatures in recent~~ centuries than reconstructions of hemispheric surface temperature trends based on a combinations of high and medium resolution "proxy" climate indicators (such as tree rings, corals, ice cores, lake and ocean sediments, and historical documentary records) that have been calibrated against the modern instrumental temperature record (e.g. Bradley and Jones, 1993; Mann et al, 1998; 1999--henceforth "MBH99"; Jones et al, 1998; Crowley and Lowery, 2000)[C & L did not "calibrate" anything, they just scaled the mean]. ~~While t~~The proxy-based temperature estimates ~~appear most~~are consistent with model-based, theoretical estimates of temperature trends over the past millennium (Free and Robock 1999; Crowley, 2001; Mann, 2000), ~~these latter estimates exhibit a~~ but these models are strongly ~~dependence~~ dependent on the sensitivity to radiative forcing that is assumed ~~in the model~~; if the larger borehole-based trends estimated by Huang et al (2000) are correct, they imply a ~~moderately~~ higher climate sensitivity than ~~do~~ the proxy-based reconstructions. Resolving the discrepancy between borehole and conventional proxy climate indicators is thus essential for a better understanding of long-term natural climate variability, and for constraining, from an empirical perspective, the true sensitivity of the climate to radiative forcing (Crowley, 2001). We show that borehole-based estimates of surface temperature changes available over the past five centuries, when properly combined and calibrated to form a hemispheric surface

temperature reconstruction, are in fact consistent with, and independently validate, proxy-based hemispheric temperature reconstructions.

An apparent advantage of geothermal borehole data *vis a vis* conventional proxy climate indicators is that they seem to provide an absolute estimate of past temperatures~~,~~ that is independent~~ly~~ of any need for calibration against the instrumental surface temperature record. Using the temperature information contained directly down the borehole, temperature profiles are used~~,~~ in combination with a simple heat diffusion inverse model, to estimate ground surface temperature changes back in time (Pollack et al, 1997; Huang et al, 2000; Harris and Chapman, 1997; 2000). It is typically assumed (e.g. H00) that boreholes sample *mean annual ~~mean~~* ground temperature variations. However, in regions with seasonal snowcover, the ground will be insulated, to varying degree, from cold-season air temperature variations. Changes over time in the duration and extent of insulating seasonal snowcover can thus influence the borehole temperature profiles, independently of annual temperature variations. Indeed, a number of other factors may influence borehole thermal profiles, including inhomogeneities in the sub-surface not adequately represented in the parameterizations of the diffusion model, sub-surface fluid heat advection, changes in permafrost depth in polar regions, and human and anthropogenic land us~~ag~~e changes. Any such factors will compromise the relationship between ~~putative reconstructions of~~ annual ground temperature and the actual annual surface temperature trends in the same region (see e.g. Skinner and Majorowicz, 1999). ~~In fact, plausible, if somewhat *ad hoc*, corrections for land-usage effects alone can bring the estimates of H00 in line w/ the proxy-based estimates (Mann, 2001). It can thus be argued that~~Hence boreholes, ~~just as~~like other types of proxy climate information (see e.g. Mann et al, 1998), must indeed be calibrated against actual surface temperature measurements for a reliable reconstruction of past temperature trends. Furthermore, this calibration should be subject to an independent verification based on statistical cross-validation.

~~Hemispheric~~ Large-scale temperature reconstructions from borehole data have recently been attempted by assimilating networks of borehole information, based on two distinct methods of obtaining past temperature histories from borehole information at a given borehole site. This includes the approach of Harris and Chapman (1997; 2001) whereby a single pre-instrumental mean ground temperature is estimated from the borehole temperature profile, and that of Pollack and coworkers (Pollack et al, 1998; H00) who use a Bayesian inverse method to estimate ~~rates of~~ century-long trends in ground surface temperature ~~change~~ for each of the past 5 centuries. ~~H00 estimate temperature reconstructions at each borehole site by integrating these rates back in time, leading to putative centennial-resolution temperature histories over the past 500 years~~. H00 average a set of 439 individual ~~such~~ borehole site temperature reconstructions available over the Northern Hemisphere (out of a global distribution of 616 sites) to obtain a reconstruction of Northern Hemisphere mean temperature over the past 500 years. They claim a close agreement with the annual instrumental Northern Hemisphere mean surface (combined land air and sea surface) temperature record (Jones et al, 1999). However, there are some important discrepancies with the instrumental record as discussed in more detail below. There are even more substantial discrepancies between the H00 reconstruction and other

long-term proxy-based reconstructions of hemispheric temperature variations. We demonstrate below that such discrepancies~~, rather than~~ do not result~~ing~~ from any fundamentally inconsistent information in the borehole~~ and~~ , instrumental or ~~-~~proxy data sources, and they can be explained in terms of how the individual borehole reconstructions must be ~~appropriately~~ weighted ~~in~~ to form~~ing~~ a representative hemispheric mean temperature estimate.

We use the same 439 Northern Hemisphere borehole temperature reconstructions of H00 but, for convenience, average and grid them onto a 5 x 5 latitude/longitude grid [EXPLAIN PROCEDURE; cf procedure used in instrumental data processing] commensurate with the instrumental surface temperature grid of Jones et al (1999). This yields 91 gridpoints (Figure 1) out of a total of 1024 covering the Northern Hemisphere. The sampling is almost entirely in the middle latitudes, with only terrestrial regions represented, and covers less than 10% of the total area of the Northern Hemisphere. Without appropriate calibration against the full Northern Hemisphere temperature record, the simple arithmetic averaging approach of H00 will impose a sampling bias in the estimate of true Northern Hemisphere mean surface temperature. More importantly, however, there are notable discrepancies between the pattern of 20th century trends in the gridded borehole temperature reconstructions and instrumental temperature record for the same gridpoints (Figure 1), with more than one in four (25/91)[CHECK—A QUICK GLANCE CAME UP WITH <25 DISCREPANCIES..] of the borehole gridpoints exhibiting the wrong sign in trend for the 20th century. The discrepancy (Figure 1, lower panel) is particularly large over western North America, where the boreholes show greater warming, likely due to the influence of anthropogenic land ~~usage~~use changes in the past century (Skinner and Majorowicz, 1999). A large discrepancy is also observed in the Arctic region, where the available borehole gridpoints show strong cooling while the same instrumental temperature gridpoints shows strong warming. This seems to conflict with the suggestion by H00 that the borehole estimates are consistent with estimated Arctic (e.g. Overpeck et al, 1997) temperature trends. We suspect that this discrepancy arises from the fact that warmer Arctic temperatures may be leading to a melting of permafrost which goes into latent, rather than sensible heating of the ground, combined perhaps with increased exposure of the ground to cold air outbreaks owing to decreases in winter snow or ice over.

[IS IT WORTH MAKING A BIG DEAL OUT OF THIS—THERE ARE ONLY 3 GRID BOXES NORTH OF 60N AND OVERPECK ET AL DATA WERE ALL >60N]

The borehole trends show far less spatial coherence, in general, than the instrumental temperature trends (Figure 1). The approach of H00 imposes uniform weight on the borehole data, regardless of signal-to-noise considerations. This is problematic in estimating a hemispheric mean temperature because it is evident from the considerations above that the borehole data contain a considerable amount of spatial noise and non-temperature related influences which will contaminate any underlying coherent temperature signal. A proper estimate of hemispheric ground temperature from these data must appropriately identify the actual temperature signal in the dataset.

[ITALICISED TEXT SEEMS TO ME TO BE THE CRUCIAL POINT—CAN IT BE MOVED UP TOWARDS THE FRONT OF THIS PARAGRAPH?]

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One can formulate more generally the reconstruction of hemispheric mean temperature T from the borehole temperature reconstructions b_i as a linear regression problem:

$$T_R = rB + s \qquad (1)$$

Where r and s are the slope and constant respectively in a linear regression of B against the instrumental temperature calibration series T_C , and where B is a weighted combination of the borehole (individual or gridded) reconstructions,

$$B = \sum_{i=1}^{N} c_i b_i \qquad (2)$$

The character of the hemispheric temperature reconstruction prior to the calibration interval will be determined, in large part, by the weights c_i, so it is essential that these weights be chosen as appropriately as possible. Calibrating B to the full Northern Hemisphere mean temperature series nominally removes the regional sampling bias in the H00 estimate discussed earlier. Because the regression coefficients r and s determine the relationship with the instrumental record, the reconstruction T_R will also show some sensitivity to the precise calibration interval used, with greater sensitivity resulting in the less robust weighting approaches. We use the Jones et al (1999) Northern Hemisphere annual mean temperature estimates from 1856-1998 for the calibration series T_C . ~~One could argue that t~~The most appropriate calibration interval is 1900-1980. The 1980 upper termination is appropriate because it is close to the median logging date (~~1977~~1979) for the network of boreholes used (i.e., since the borehole network, on the average, can only have seen warming observed through around 1980, it is inappropriate to calibrate in the enhanced warming of the past two decades). The 1900 lower termination is motivated by the fact that the 19th century (and, to a lesser extent, early 20th century) Jones et al (1999) hemispheric estimates are slightly biased (on the cold side) due to an extratropical sampling bias in the time-evolving mask used [this small bias is easily corrected for (Rutherford et al, 2001), and its impact here, though non-zero, is relatively minimal]. However, on the other hand, a 1900-1980 calibration suffers from the fact that there are only two degrees of freedom (mean and slope) in the calibration of the century-resolution borehole reconstructions, while an 1856-1980 calibration interval provides 3 degrees of freedom (a mean and a hinge with separate 19th and 20th century slopes) and therefore provides a potentially more robust calibration. We thus investigate the sensitivity of the reconstruction to three different calibration intervals: 1) 1856-1980, 2) 1900-1980, and 3) 1900-1998. We note that the latter two calibration intervals allow for the possibility of independent cross-validation of the 19th century borehole trends [with the calibration and cross-validation periods having two and one statistical degrees of freedom respectively--one degree of freedom is lost in the cross-validation period owing to the required piecewise continuity of the 19th and 20th century trends].

There are a number of simple weighting schemes that can ~~readily~~ be ~~motivated~~used. Perhaps the least defensible of these is that of (1) uniform weights (c_i=1), which is equivalent to the methodology used by H00~~, although H00 do not calibrate their estimate~~

~~against the instrumental record~~.[BEEN THERE, DONE THAT] Using the calibrated H00 (uniform) weighting scheme applied to the 439 individual borehole records yields a reconstruction similar to, if slightly warmer than, the uncalibrated H00 reconstruction (whose mean we have referenced to the period 1900-1980 for comparison to the instrumental record; Figure 2, panel a). The reconstructions, however, shows considerable sensitivity to the calibration interval used. [omit the following discussion re 1900-1998 data]Using the entire 20th century (1900-1998), which forces the borehole data to conform to the warming trend of the full 20th century, leads to a greater cooling back in time, and a slightly colder reconstruction than H00, while using the interval 1856-1980 interval yields less cooling back in time, and a significantly warmer reconstruction than H00. This result arises from the fact that the 19th century instrumental series actually exhibits a cooling trend ~~counter~~ (in contrast to the strong ~~warming~~ 19th century warming trend in the H00 reconstruction ~~(~~ or any uniform weighting of the borehole data), and this strongly constrains the amount of 19th century cooling allowed by the borehole reconstruction, if used for calibration. The most defensible "uniform" weighting scheme involves forming a weighted sum of the 91 gridded borehole series,, accounting for their areal representation over the hemisphere (i.e., using a latitudinal weighting factor c_i=cos[ϕ_i], where ϕ_i is the latitude of the associated borehole gridpoint). This, nevertheless, yields a reconstruction (Figure 2, panel a) that is qualitatively similar to the H00 reconstruction. Though the amplitude of the reconstruction is variable, any uniform weighting of the borehole data imposes a monotonic cooling back in time to 1500, and a hemispheric temperature reconstruction of past centuries that is significantly colder than that of MBH99. Moreover, because of this long-term monotonic trend, a small increase in the calibrated modern warming trend extrapolates to significantly colder baseline temperature during the 15th-18th centuries. The H00 reconstruction itself resolves 53% percent of the 1900-1980 decadal instrumental temperature variance, but only 6% of the variance during the 1856-1899 period. The calibrated H00 reconstruction (and any best-fit linear trend to the instrumental record) resolves 54% of the decadal temperature variance over the 1900-1980 calibration period ~~[the figure is 73% for 1900-1998 calibration, the larger number owing to the greater relative prominence of the recent trend]~~. However, the verification 1856-1899 resolved variance~~s are negative (-26%) for the 1900-1998 calibration, and a modest~~ is 36% for the 1900-1980 calibration. A moderately better cross-validation resolved variance results from the latitude-weighted borehole reconstruction (37%)[IS THIS WORTH MENTIONING EVEN? it leads to one more confusing line on the figure….]. In each of these cases, however, the skillfulness of verification is limited by the fact that the uniform weighting scheme imposes a warming 19th century, counter to the cooling trend in the instrumental record. *The monotonic long-term warming trend that arises in the uniform weighting scheme represents a very small residual that results from the~~of~~ cancellation of much larger, nearly spatially random positive and negative trends over the first 4 centuries (this is less true for the 20th century). . Because of the very low signal-to-noise ratios in the individual borehole reconstructions, the uniform weighting scheme is far from the optimal weighting scheme, and the long-term trend ~~will be seen to be~~ is highly sensitive to perturbing the weights from their uniform values. ~~The~~ However, the sensitivity of the reconstruction to the precise calibration interval used ~~arising~~ in the uniform weighting approach (Figure 1)*

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~~*will be seen to*~~ *diminishes*, ~~*moreover,*~~ *as the methodology takes into account signal vs. noise issues in weighting the borehole data.*

[this italicsed section makes a crucial point and deserves a figure—see my notes]

A preferable approach (2) involves weighting the borehole gridpoint data by the strength of their relationship with local temperature trends, based on a local linear regression between the borehole and associated instrumental temperature gridpoint data ($c_i = r_i \cos[\phi_i]$, where r_i is the correlation coefficient between the borehole and temperature gridpoint series during the calibration interval). The associated pattern of weights is shown in Figure 3. This approach appropriately gives greater weight to boreholes in areas where the signal-to-noise in the associated temperature trend signal is greatest. The method also allows for a negative relationship between the borehole and temperature gridpoint trends (which, as shown earlier, occurs for more than one in four gridpoints). ~~Such a relationship might arise, for example, as discussed earlier, in polar areas where surface air warming has influenced seasonal permafrost, or in areas with increased seasonal snow cover where the warming ground temperature is an artifact of increased insulation of the ground from cold winter air outbreaks in a scenario of anomalously cold but snowy winters. The local regression based weighting approach, however, cannot identify and remove patterns of trend that are associated with non-climatic (i.e., land-usage change) effects.~~ [been there….]This local regression weighting scheme yields a hemispheric temperature reconstruction that is considerably warmer in past centuries than the H00 reconstruction, though still somewhat colder, in general, that the MBH99 reconstruction (Figure 2, panel b. The reconstruction is far less sensitive to the precise calibration interval used than in the uniform weighting scheme. For the 1856-1980 calibration, the borehole reconstruction is nearly within the uncertainties of the MBH99 reconstruction, and the earliest (15th) century estimates from the borehole reconstruction are consistent with the MBH99 reconstruction within estimated uncertainties. The reconstructed 19th century warming trend is strongly diminished, though still positive, and the cross-validation resolved variance (44%) is only moderately lower than the 1900-1980 calibration resolved variance of 54%.

A third, ~~and, we assert, yet~~ more optimal approach ~~(3)~~ generalizes upon the local regression weight scheme discussed above, but uses both local and non-local information to weigh the borehole gridpoint data by the strength of their relationship with large-scale patterns of variance in both the instrumental temperature data and long-term borehole reconstructions. To accomplish this, we use a technique developed for ~~imputing~~ estimating values ~~for~~ of missing data based on an iterative estimate of the covariance structure of the incomplete dataset (Schneider, 2000; Rutherford et al, 2001). We apply this technique to the joint borehole and instrumental gridpoint data formulated as a single combined dataset in which values for the instrumental series are prescribed as absent prior to the calibration interval, but are optimally infilled based on the covariance information in the available data. We can then readily diagnose the set of weights on the borehole gridpoint data that yield the optimal temperature pattern reconstructions. This approach favors the weighting of borehole gridpoints which correlate during the calibration period w/ patterns of variance in the instrumental data, but also penalizes those boreholes which covary least well w/ the other borehole data during the entire 5 century interval. Figure 2 (panel c) shows the resulting reconstruction. It is noteworthy

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that the long-term reconstruction is largely robust with respect to the calibration interval used, with only slight differences between the 1856-1980 and 1900-1980 calibrations. For both calibration periods, the borehole hemispheric temperature reconstruction is statistically indistinguishable from the MBH99 reconstruction. The borehole reconstruction based on 20th century calibration independently produces the 19th century cooling trend in the instrumental temperature record (and MBH reconstruction) and yields a remarkably high (80%) cross-validation resolved variance for the 1856-1899 period (this is larger than the 54% calibration period resolved variance primarily because of the lesser prominence of decadal variability, relative to trend, during this period of the instrumental record). Interestingly, the resulting trend is also similar to the borehole temperature reconstructions of Skinner and Majorowicz (1999) for northwestern North America and Beltrami et al (1995) for eastern Canada, using alternative functional space inversion techniques to that used by H00. In the latter case, the reconstruction was also shown to be similar to temperature reconstructions from tree ring information (Beltrami et al, 1995).

The resulting spatial distribution of weights from the covariance-based approach is shown in Figure 3. It is instructive to compare with the pattern of weights based on local calibration weighting method. A considerably larger fraction of the borehole gridpoints are ascribed negative weights (50% vs. 29% in the case of local regression weighting approach). Unlike the local regression weights, the covariance-based weighting scheme allows for the removal of patterns of warming in the borehole data that are not identified as relating to observed large-scale temperature changes. The negative gridpoint weights do not indicate, in the covariance-based approach, the assumption of a negative local relationship between the borehole and temperature gridpoint data. Rather, they imply that a combination of positive and negative weights on different patterns of variance in the borehole data can be used to remove patterns of bias in the borehole data network that appear unrelated to large-scale patterns of variation in the instrumental record during the calibration period. Such patterns of bias are evident in the discrepancy between the 20th century gridpoint temperature and borehole trends (Figure 1, lower panel). Negative weights thus arise in regions where this pattern of bias has larger projections in certain regions, even if the local temperature relationship is a positive one. Substantial negative weights are observed (for both calibration periods) in particular, over large parts of North America (especially western North America) where borehole 20th century trends show too much warming relative to the instrumental record (Figure 1, lower panel). We interpret these negative weights here, as well as perhaps in other regions, as an attempt of the covariance algorithm to remove this spurious pattern of ground warming (likely associated with land ~~usage~~use changes--i.e., Skinner and Majorowicz, 1999) in calibrating a surface temperature relationship. By removing this spurious pattern from the calibrated relationship, the method effectively, teases out a substantial pattern of 19th and 20th century warming in the borehole data, which it identifies as non-temperature related, yielding for example a 19th century cooling trend, while still matching the observed 20th century hemispheric warming.

The borehole-based reconstruction of hemispheric temperature variations are most directly comparable to proxy-based estimates of annual hemispheric mean temperatures

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(e.g. Mann et al, 1998;1999; Crowley and Lowery, 2000) and less comparable to those of hemispheric/mid-latitude warm-season (Jones et al, 1998; Briffa et al, 2001) or, in particular, high-latitude warm-season (Overpeck et al, 1997) temperatures. These ~~latter~~ reconstructions, nonetheless, can be recalibrated against the instrumental full hemisphere annual mean series for comparison. Figure 4 compares the borehole temperature reconstructions from the covariance-based weighting scheme described above, to the **best-fit piecewise continuous linear centennial** [???? come again??rephrase this!!]trends for a number of different proxy-based Northern Hemisphere temperature reconstructions. The borehole reconstruction is observed to be statistically indistinguishable not only from the MBH99 reconstruction, but also other recent proxy-based reconstructions (Crowley and Lowery 1999; and Jones et al, 1998--the latter, if calibrated against the 1856-1980 instrumental record). Also shown for comparison are the MBH99 reconstruction based both on *only non-tree ring*, and *only tree ring* indicators (see Mann et al, 2001). The considerable overall similarity between even the "tree-ring only" proxy reconstruction and the optimal borehole temperature reconstructions refute the argument (Broecker, 2001) that tree-ring indicators, when appropriately processed and quality-controlled, are inherently less able to resolve century-scale variability than borehole data (Beltrami et al, 1995 have indeed already demonstrated otherwise).

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In summary, we have shown that previous estimates of ground temperature changes over the past five centuries based on uniformly weighted means of spatial borehole data are not a reliable estimate of surface air temperature variations in past centuries. As one introduces a weighting method which~~, in an increasingly plausible manner,~~ distinguishes between signal and noise in the data, one achieves an estimate of hemispheric temperature change that is ~~increasingly~~ close to previously published proxy-based estimates (Mann et al, 1998; MBH99; Jones et al, 1998; Crowley and Lowery, 2000). The most defensible weighting scheme, which takes into account the coherence within the borehole data and between borehole and instrumental data, and effectively removes non-temperature related patterns of bias from the borehole data, yields a reconstruction of Northern Hemisphere surface temperature variation which is statistically indistinguishable from the MBH99 reconstruction, and other independent proxy-based reconstructions of Northern Hemisphere temperature changes (e.g. Crowley and Lowery, 2000). It is thus incorrect to argue (e.g. Broecker, 2001; and response by Bradley et al, 2001) that the information from terrestrial borehole data conflict with conclusions regarding past hemispheric temperature changes from MBH99 or other proxy-based reconstructions. Rather, it appears that borehole data, properly analyzed, reinforce conclusions based on other proxy information. Moreover, There would~~, moreover,~~ appear to be considerable merit in efforts to combine borehole and other low-resolution proxy climate indicators with high-resolution information from tree rings, corals, ice cores, and other high-resolution proxy data, in reconstructions of large-scale temperature patterns over the past millennium and further. Such efforts are currently underway, and should lead to increasingly robust estimates of past climate change.

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The authors thank Henry Pollack for kindly making available the borehole temperature reconstruction used in this study, and acknowledge helpful discussions w/ H. Pollack, P. Jones, T. Crowley, J. Overpeck, and R. Harris. The authors gratefully acknowledge ongoing support for this work from the NSF, the Department of Energy and NOAA ~~sponsored Earth Systems History Program.~~
[this year NOAA contributed only $340,000 to ESH—a sore point and not one we want to rub salt into by implying that they "sponsor" this program…]

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FIGURE CAPTIONS

Figure 1

Comparison of linear 20th century gridpoint trends 1900-1980 with the (91 gridpoint) borehole grid mask applied for (top) gridded borehole reconstructions, (middle) instrumental surface temperature record and (c) difference between borehole and

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instrumental trends. Scales are ^{o}C for the instrumental gridpoint data and nominal ^{o}C (based on H00 inversion) for the borehole gridpoint data.

Figure 2

Comparison of borehole reconstructions using different weighting schemes described in text, with MBH99 reconstruction. The MBH99 reconstruction is smoothed on timescales longer than 40 years (thick magenta) with best-fit century piecewise continuous linear trends (thick magenta, dashed), shown for comparison with borehole, along with the associated 95% uncertainty (yellow shaded) region (see MBH99; Mann, 2000). Raw instrumental Northern Hemisphere series (light gray) is shown for comparison. A) Comparisons between Huang et al hemispheric reconstruction (referenced to the 1900-1980 mean of the instrumental record) and calibrated borehole reconstructions based on the uniform weighting scheme (scheme "1" in text), using different calibration periods and/or areal corrections, B) Comparison with calibrated borehole reconstructions based on local-regression weighting scheme (scheme "2" in text), C) Comparisons with calibrated borehole reconstructions based on covariance-based weighting scheme (scheme "3" in text).

Figure 3

Spatial map of relative weights on borehole gridpoint data, based on (a) local calibration method (scheme "2" in text), and (b) covariance-based weighting method (scheme "3" in text). Weights are shown based on both 1900-1980 and 1856-1980 calibration periods. For comparison, the simple uniform weighting scheme approach (scheme "1" in text) would have spatially-uniform weights, while the areally-adjusted uniform weighting scheme would show all positive weights, with only a small zonally-uniform variation with latitude.

Figure 4

Comparison of H00 and alternative borehole-based hemispheric trend reconstructions with best-fit piecewise continuous linear centennial scale trends for alternative proxy-based hemispheric temperature reconstructions, showing the 95% uncertainty region for the MBH99 centennial trend series. In the case of the Jones et al (1998) reconstruction, which is nominally an extratropical warm-season estimate, the series has been re-calibrated to the full Northern Hemisphere annual mean instrumental record based on both 1856-1980 and 1900-1980 calibration periods. All other proxy-series shown are based on the original published calibrations, but aligned to conform to a 1961-1990 zero reference period. Raw instrumental Northern Hemisphere series (light gray) is shown for comparison.

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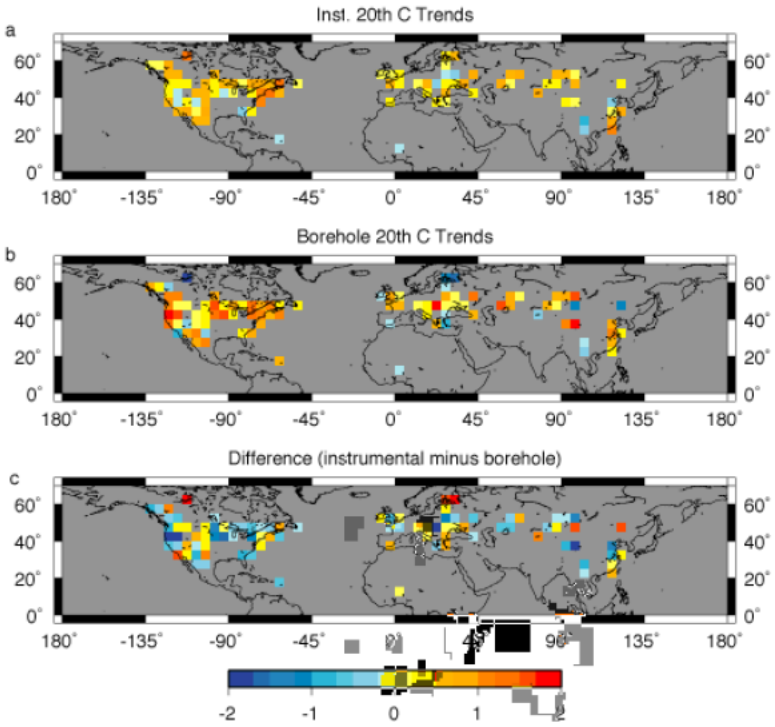

FIGURE 1

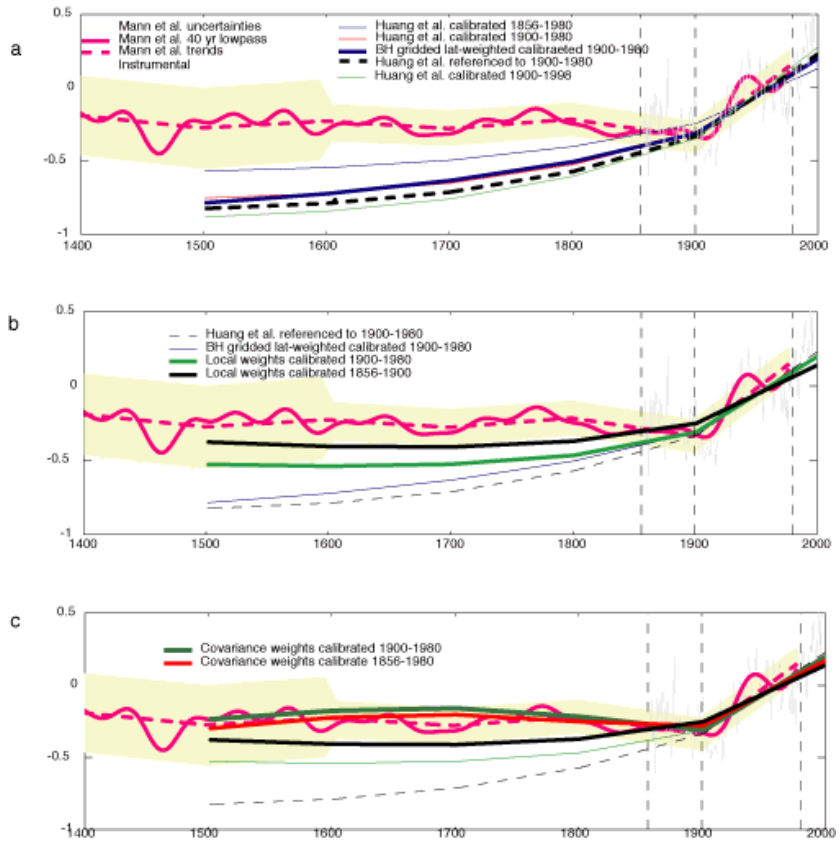
a
Mann et al. uncertainties
Mann et al. 40 yr lowpass
Mann et al. trends
Instrumental
Huang et al. calibrated 1856-1980
Huang et al. calibrated 1900-1980
BH gridded lat-weighted calibraeted 1900-1980
Huang et al. referenced to 1900-1980
Huang et al. calibrated 1900-1998
b
Huang et al. referenced to 1900-1980
BH gridded lat-weighted calibrated 1900-1980
Local weights calibrated 1900-1980
Local weights calibrated 1856-1900
c
Covariance weights calibrated 1900-1980
Covariance weights calibrate 1856-1980
0.5
0
-0.5
-1
1400
1500
1600
1700
1800
1900
2000

FIGURE 2

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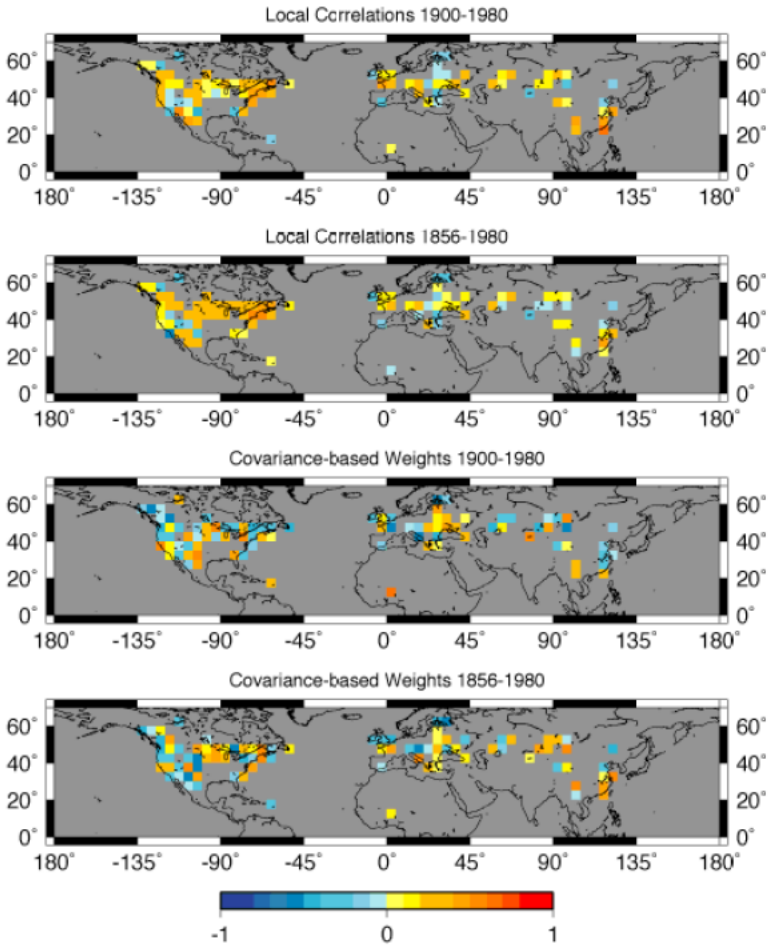

FIGURE 3

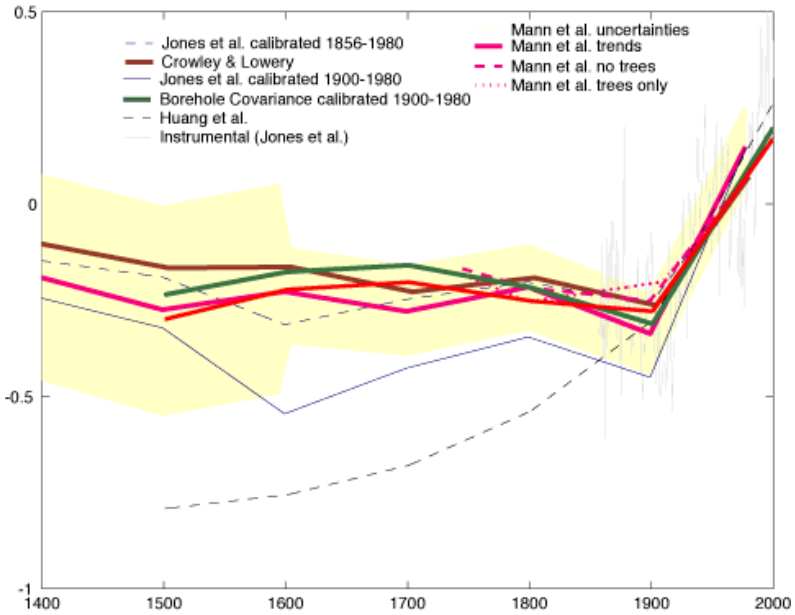
Jones et al. calibrated 1856-1980
Crowley & Lowery
Jones et al. calibrated 1900-1980
Borehole Covariance calibrated 1900-1980
Huang et al.
Instrumental (Jones et al.)
Mann et al. uncertainties
Mann et al. trends
Mann et al. no trees
Mann et al. trees only
0.5
0
-0.5
-1
1400
1500
1600
1700
1800
1900
2000

FIGURE 4

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From: Michael E. Mann
To: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; srutherford@gso.uri.edu; mann@virginia.edu
Subject: revised analyses
Date: Tuesday, September 18, 2001 2:21:31 PM

Dear Malcolm/Ray,

Scott and I have discussed this at some length. We feel that all of the substantial criticisms can be addressed through the following additional analyses. Some of these can be shown explicitly in the revised paper, some will be made available to reviewers/as supplementary information, but, because of length restrictions, won't necessarily be shown.

Comments welcome,

mike

1. revisit the sensitivity to the precise 20th century calibration interval (1900-1960, 1900-1980, 1900-2000) to address the issue of logging date and sensitivity of boreholes to past warming. Note that reviewer A and Pollack are completely inconsistent on their belief as to whether the full 20th century or only early 20th century warming are captured by the data. The inconsistencies are remarkable, and will be thoroughly exploited in our response...

2. We can nip in the bud the argument that the early 19th century might have been much colder than the latter 19th century, and that this might account for the 19th century borehole warming. Albeit obviously imperfectly and w/ considerable sampling uncertainty, the instrumental N. Hem annual mean temperature record can be extended back to 1800 based on the dozen or so available gridpoints (all in Europe and North America), scaling the variance to account for the sparse sampling. The match w/ the Jones annual full N. Hem record from 1856-1980 is pretty good (r=0.45) and the long-term trend is much like what we reconstruct, long-term cooling during the *entire* 19th century, and actually a warming in the late 18th century. Obviously this is an imperfect extension of the instrumental record, but the point is that it *is* an objective set of data, independent of both proxy and borehole data, that shows that the cooling in the 19th century is not at all restricted to the latter half of the 19th century. And the scaled instrumental series available back to 1762 is consistent w/ MBH98, and clearly not consistent w/ Pollack. Another nail in the coffin for the boreholes.

3. To reinforce how lousy the borehole data are, Scott did another calculation of the correlation of each individual borehole w/ the associated instrumental gridpoint series (rather than, as in the paper, using the gridded borehole data which gets rid of a good deal of noise). 50% have the wrong sign! 50%!!!! We will not allow the borehole crowd to get out of this one. Their data, as they present it (surface temperature indicator) is crap, and the world needs to know it...

4. We will do an analysis where the borehole gridpoint data are preserved prior to 1900, but where the 20th century trend is set *precisely* equal to the 20th century instrumental trend for the associated gridpoint. We will (hopefully) be able to show that in this case, our methods reconstruct a long-term monotonic warming (ie, cooling back in time) a la Pollack et al. In other words, that the RegEM approach *will* reconstruct a long-term monotonic trend like Pollack et al find *if* that is truly the signal that

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is carried by the data (as is the case, if we force it to be!). This will head off any criticism that our method is in any way forcing the result we get...

5. Finally, we will do a Monte Carlo analysis to estimate the robustness of the local regression and RegEM approach given the data at hand (addressing reviewer 2's legitimate concerns, but also, at the same time, the comments of reviewer 1 and Pollack). The idea here is that we will take the the borehole trends and perturb them based on the standard errors in the regressions of the borehole gridpoint against the associated temperature gridpoint. We'll do maybe 5 realizations of this, which will produce 5 independent realizations of a process consistent w/ both the surface temperature signal and the noise we believe is contained in the borehole data, but varying the noise realization to produce a distribution. This will give us an idea of what the robustness in our reconstructions is, given the limited information in the data, and addresses most of the statistical issues brought up by reviewer 2. But hopefully it will also show that our local regression weights and RegEM reconstructions are centered within an envelope of uncertainty that closely overlaps the uncertainty in the multiproxy reconstruction, though, I expect not the Pollack et al reconstruction.

If this all works out as I hope, I don't see any legitimate arguments the borehole crowd can come up with, and if an arbitrating non-borehole reviewer is required to settle this, I'm quite convinced we'll win out...If this doesn't make it in Nature, it'll make a great Science article,

mike

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From: Malcolm Hughes
To: Michael E. Mann; Raymond S. Bradley
Cc: mhughes@ltrr.arizona.edu
Subject: Re: response to GRL
Date: Thursday, April 04, 2002 5:14:16 PM

Dear Mike - I was dismayed by the reviews, too, although I guess I've seen enough ill-considered reviews and editorial decisions (from my point of view) over the years to have acquired some degree of immunity. Of course, I have often been helped greatly by reviewers and thoughtful editors.
I must also say, however, that I was also dismayed by the tone and intensity of your response, for the same reasons as Ray. Dealing with unknown professional colleagues is a little like what I was told about working in China - never let your frustration or anger show, because it will diminish you in the eyes of those you need to influence. Believe me, I know it can be very hard to stick to this, so I hope I'm not being santimonious.
Probably, all that the folks you have written to about the decision know about you now is that you are angry. This will register much more strongly than your reputation as a scientist, or the merits of the case, which is a terrible shame. Therefore, I am not too optimistic about the decision being reviewed, let along reversed. I think we could, as a group, have crafted a persuasive case, based on the inadequacies of the reviews, for further consideration of the manuscript. I take your point that as first author you catch the brunt of the flak in the very politicized atmosphere surrounding this kind of work, and this distresses me. That does not mean, however, that you need to respond alone. Reviewer 'A' was pretty well saying that I am an idiot who knows less about tree rings than his students. I would certainly have wanted to respond to this editorial decision, but by focussing on the issues, and so leaving "the other guy", in this case the editor, some room in which to back off.
The best remedy is probably to get another, good, journal, to accept it, and then, at least in our view, the loss will all be GRL's. Would this fit into 'The Holocene's" new "rapid" category?

Sticking to our strengths, which are ideas, methods and data, will serve us especially well even if, as may well be the case, this field in the U.S. is operating in a changed ideological atmosphere. One thing we can try is to continue to do a really good job, and that will outlast any particular Congressional cycle.

Whilst I'm playing the ancient prof., I have to say that the experiences of the last few years, on several fronts, have caused me to revise downward my opinion of "Nature" and "Science" in general, and to revise upward my view of the value of publishing in specialist journals where, as you must know from "Journal of Climate", the review process seems to be much more thorough.
Finally - on a cheerful note, the plots of Juerg's new

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reconstruction vs MBH Europe are really cool - isn't that a strongly common centennial trend of almost exactly the same amplitude I spy from the mid-18th to late-19th century? I'm taking Heinz Wanner and Henry Diaz to dinner this evening, and it will be a pleasure to show them the plots.

Let's learn and move forward,

Cheers, Malcolm

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From: Scott Rutherford
To: Malcolm Hughes; Raymond Bradley; Tim Osborn; Keith Briffa; Phil Jones; Mann Mike
Subject: Re: revised NH comparison manuscript
Date: Friday, July 11, 2003 12:29:24 PM

Dear All,

This is a reminder that I would like your comments on the revised NH comparison manuscript by mid next week so I can incorporate everyone's comments and submit a manuscript by late this month. If I don't hear from you by 5:00pm EDT on Wednesday, July 16, I will assume that you are comfortable submitting the manuscript as it is.

The general consensus was to send it to Journal of Climate. This means that we have to have all authors sign the copyright form when the manuscript is submitted. I will let everyone know when I submit the manuscript and will e-mail a PDF of the copyright form for everyone to sign and fax to AMS to be followed by hard copy.

Regards,

Scott

On Tuesday, June 3, 2003, at 02:51 PM, Scott Rutherford wrote:

>
>
> Attached to this e-mail is a revision of the northern hemisphere
> comparison manuscript. First some general comments. I tried as best as
> possible to incorporate everyone's suggestions. Typically this meant
> adding/deleting or clarifying text. There were cases where we
> disagreed with the suggested changes and tried to clarify in the text
> why.
>
> In this next round of changes I encourage everyone to make specific
> suggestions in terms of wording and references (e.g. Rutherford et al.
> GRL 1967 instead of "see my GRL paper"). I also encourage everyone to
> make suggestions directly in the file in coloured text or by using
> Microsquish Word's "Track Changes" function (this will save me
> deciphering cryptic penmanship; although I confess, my writing is
> worse than anyone's). If you would prefer to use the editing functions
> in Adobe Acrobat let me know and I will send a PDF file. If you still
> feel strongly that I have not adequately addressed an issue please say
> so. I will incorporate the suggestions from this upcoming round into
> a manuscript to be submitted. After review, everyone will get a crack
> at it again.
>
> I will not detail every change made (if anyone wants the file with the
> changes tracked I can send it). Here are the major changes:
>
> 1) removal of mixed-hybrid approach and revised discussions/figures
> 2) removal of CE scores from the verification tables
> 3) downscaling of the Esper comparison to a single figure panel and
> one paragraph.
> 4) revised discussion of spatial maps and revised figure (figure 8).
> 5) seasonal comparisons have been revised
>

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> Several suggestions have been made for where to submit. These are
> listed on page 1 of the manuscript. Please indicate your preference
> ASAP and I will tally the votes.
>
> I would like to submit by late July, so if you could please get me
> comments by say July 15 that would be great. I will send out a
> reminder in early July. If I don't hear from you by July 15 I will
> assume that you are comfortable with the manuscript.
>
> Please let me know if you have difficulty with the file or would
> prefer a different format.
>
> Regards,
>
> Scott
>
> <nhcomparison_v7_1.doc>
> _____
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>
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_____
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From: Michael E. Mann
To: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu
Cc: Scott Rutherford; mann@virginia.edu
Subject: Fwd: Mann et al 1998
Date: Friday, December 19, 2003 10:48:19 AM

Hi Ray,

Well said!

Lets see what they say. I'm placing on my calander "Jan 31st" as the deadline to respond to the various inquiries. Meanwhile, we can address any remaining data issues in the time being.

Scott: We could approach Dave Stahle for some specific information on which chronologies are which, and what the proper references are. Can you send me the names of the chronologies we definitely used from Stahle's dataset, and I'll forward to him for any further information he can provide.

Thanks all,

mike

> X-Sender: rbradley@eclogite.geo.umass.edu
> X-Mailer: QUALCOMM Windows Eudora Version 6.0.1.1
> Date: Fri, 19 Dec 2003 12:38:19 -0500
> To: H.Langenberg@nature.com
> From: "raymond s. bradley" <rbradley@geo.umass.edu>
> Subject: Mann et al 1998
> Cc: mhughes@ltrr.arizona.edu, mann@multiproxy.evsc.virginia.edu,
> srutherford@rwu.edu
>
> Hi Heike:
> With reference to the questions posed (endlessly, it seems) by McIntyre and colleague, this is to let you know that we are preparing a complete response which will be our last word on the matter.
> These inquiries have taken an enormous amount of Mike Mann's time. You no doubt recognise that this work was carried out in 1996-1997 so there are questions that require some thought to try and recall why a particular decision was made 6 or 7 years ago. The implication that data selections were made to deliberately fix the results are contemptuous and insulting. Nobody seems to have asked the question as to why in McIntyre's "audit" and "correction" of our work, he comes up with a totally implausible result that - if true --- would show that the onset of the main phase of the "Little Ice Age" occurred at a time when temperatures were as warm as in the 20th century --a remarkable result indeed.
> Despite this asinine result, you can rest assured, we are doing the best job we can to supplement what we had previously provided to document our data and procedures, and will provide what is necessary to respond to the questions posed. I would note, however, that the US NSF is satisfied that we have met our obligations already in this matter....nevertheless, we are prepared to go the extra mile to be as open and clear as we can be. However, given the holiday season now upon us and the fact that

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Malcolm Hughes will be away until mid-january, and I'll be gone until Jan 23rd, it's not likely that we can provide a final response before the end of tat month. We don't want to come up with something incomplete that will then provide fodder for another round of queries.
Sincerely
Ray

Raymond S. Bradley
University Distinguished Professor
Director, Climate System Research Center*
Department of Geosciences, University of Massachusetts
Morrill Science Center
611 North Pleasant Street
AMHERST, MA 01003-9297

Tel: 413-545-2120
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Professor Michael E. Mann
Department of Environmental Sciences, Clark Hall
University of Virginia
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---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137
http://www.evsc.virginia.edu/faculty/people/mann.shtml

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From: Michael E. Mann
To: Scott Rutherford; Bradley Raymond; Hughes Malcolm; Jones Phil; Osborn Tim; Briffa Keith; mann@virginia.edu
Subject: Re: J. Climate reviews
Date: Friday, January 16, 2004 1:08:06 PM

Dear All,

The first review is insightful and helpful, the 2nd review provides relatively little insight. It promotes a number of myths, and plays gratuitous homage to the work of the Hamburg group (a hint as to where the reviewer might be from!). However, where reasonable points are raised by this reviewer, too they should be dealt with too.

I don't think the paper can be split up, but it can probably be shortened a bit. I propose Scott and I take the first stab at revising and responding to reviewer comments, and then send it on to the others. Scott and I had discussed plan to make the matlab codes and data used available in a website mentioned in the paper, to avoid any possible criticisms of availability. Is there any problem in posting the version of the MXD data set used publiclly (Tim, Keith?), and any other thoughts on this?

Please feel free to send any comments, while Scott and I begin to work on the revised version...

Thanks,

mike

I At 02:25 PM 1/16/2004 -0500, Scott Rutherford wrote:

> Dear All,
>
> Attached are the reviews from the Journal of Climate manuscript. One generally good, one generally weird.
>
> Scott

Scott Rutherford

Assistant Professor
Dept. of Natural Sciences
Roger Williams University
e-mail: srutherford@rwu.edu
phone: (401) 254-3208
snail mail:
One Ferry Road

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From: Scott Rutherford
To: Malcolm Hughes; Raymond Bradley; Tim Osborn; Keith Briffa; Phil Jones; Mann Mike
Subject: Re: revised NH comparison manuscript
Date: Friday, July 11, 2003 12:29:24 PM

Dear All,

This is a reminder that I would like your comments on the revised NH comparison manuscript by mid next week so I can incorporate everyone's comments and submit a manuscript by late this month. If I don't hear from you by 5:00pm EDT on Wednesday, July 16, I will assume that you are comfortable submitting the manuscript as it is.

The general consensus was to send it to Journal of Climate. This means that we have to have all authors sign the copyright form when the manuscript is submitted. I will let everyone know when I submit the manuscript and will e-mail a PDF of the copyright form for everyone to sign and fax to AMS to be followed by hard copy.

Regards,

Scott

On Tuesday, June 3, 2003, at 02:51 PM, Scott Rutherford wrote:

>
>
> Attached to this e-mail is a revision of the northern hemisphere
> comparison manuscript. First some general comments. I tried as best as
> possible to incorporate everyone's suggestions. Typically this meant
> adding/deleting or clarifying text. There were cases where we
> disagreed with the suggested changes and tried to clarify in the text
> why.
>
> In this next round of changes I encourage everyone to make specific
> suggestions in terms of wording and references (e.g. Rutherford et al.
> GRL 1967 instead of "see my GRL paper"). I also encourage everyone to
> make suggestions directly in the file in coloured text or by using
> Microsquish Word's "Track Changes" function (this will save me
> deciphering cryptic penmanship; although I confess, my writing is
> worse than anyone's). If you would prefer to use the editing functions
> in Adobe Acrobat let me know and I will send a PDF file. If you still
> feel strongly that I have not adequately addressed an issue please say
> so. I will incorporate the suggestions from this upcoming round into
> a manuscript to be submitted. After review, everyone will get a crack
> at it again.
>
> I will not detail every change made (if anyone wants the file with the
> changes tracked I can send it). Here are the major changes:
>
> 1) removal of mixed-hybrid approach and revised discussions/figures
> 2) removal of CE scores from the verification tables
> 3) downscaling of the Esper comparison to a single figure panel and
> one paragraph.
> 4) revised discussion of spatial maps and revised figure (figure 8).
> 5) seasonal comparisons have been revised
>

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> Several suggestions have been made for where to submit. These are
> listed on page 1 of the manuscript. Please indicate your preference
> ASAP and I will tally the votes.
>
> I would like to submit by late July, so if you could please get me
> comments by say July 15 that would be great. I will send out a
> reminder in early July. If I don't hear from you by July 15 I will
> assume that you are comfortable with the manuscript.
>
> Please let me know if you have difficulty with the file or would
> prefer a different format.
>
> Regards,
>
> Scott
>
> <nhcomparison_v7_1.doc>
> _____
> Scott Rutherford
>
> Marine Research Scientist
> Graduate School of Oceanography
> University of Rhode Island
> e-mail: srutherford@gso.uri.edu
> phone: (401) 874-6599
> fax: (401) 874-6811
> snail mail:
> South Ferry Road
> Narragansett, RI 02882

_____
Scott Rutherford

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From: Michael E. Mann
To: Tim Osborn; Scott Rutherford; Bradley Raymond; Hughes Malcolm; Briffa Keith; Jones Phil; mann@virginia.edu
Subject: Re: revised manuscript
Date: Wednesday, June 16, 2004 6:51:25 AM

HI Tim,

Thanks--your suggestions (w/ Keith and Phil) all are very helpful, and improve the manuscript significantly. This was exactly what was needed!

A couple minor clarifications on some points that were raised:

1. In discussing how spatial reconstructions are averaged to get hemispheric means, we just meant that, not that these spatial reconstructions were the results of CFR approaches. I believe it is true that Briffa et al, 1998a does average gridpoint reconstructions to get a hemispheric mean, right? We should clarify the wording to make sure that this is clear. The issue of different approaches (CFR vs local calibration) is discussed later in the paper...

2. Re, McINtyre/McKitrick: they didn't identify any "errors" at all. They (a) used an incorrect spreadsheet representation of the data (which Scott prepared based on a misunderstanding of precisely what they were looking for, since the predictors cannot be included in a single matrix because of the stepwise nature) and (b) used different versions of certain series that were on the NGDC site. There were some minor errors in the supplementary information, and we have a corrigendum in press in "Nature" that makes note of these. I agree that we should add a sentence clarifying how PCs were calculated in the PC/proxy network at the beginning of that section.

3. You're right that RE is not necessarily less than r^2 in calibration. That statement is rightfully removed...

4. I believe that including weights in the hybrid approach that are proportional to the fraction of variance resolved by the indicator is essential. In fact, we know that we get completely wild results if we don't do that. The reason is that an indicator that has essentially no low-frequency variability left (say, an already pre-whitened tree-ring chronology) has essentially only noise left in the low-frequency band. Now, if you use the weighting convention we use, it gets almost no weight. On the other hand, if you give it full weight in that band, you magnify that tiny bit of residual noise up to the full amplitude of all other indicators, and now you've got completely noise competing w/ other series that have much more signal. I think a sentence needs to be added to clarify this point, and also a sentence added that indicates that highly unconstrained results are possible if this is not done. The example of weights of 0 and 1 is an extreme limiting case, which is probably never realized (Scott?).

5., Re the ECHO-G simulations, yes we can certainly downplay the discussion of this in our response. However, I stand by the claim that they appear to use a solar forcing that is about twice that of Crowley's! In the talk they gave in Nice (Phil was there), they showed their solar constant varying between 1362 and 1368 W/m^2 over the past millennium! That is much larger than Crowley. As no details are provided in the Gonzalez-Rouco paper, this is very difficult to discern. However, the huge Medieval peak, and the claim that 40% of 20th century warming is solar-driven (they make both claims) is ONLY consistent w/ a much larger solar forcing then anyone else has used. Christiensen's group has used Crowley's forcings on the same

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exact model, and gets nothing near the amplitude of variability they got (like the GKSS paper, I believe this paper is in submission). There is something very odd in what the GKSS group has done, and I think Phil agrees w/ this. It would be unfortunate if the issue of precisely how large a solar forcing they used isn't examined closely before they publish their results in more detail.

But I agree we don't need to get into this in the paper or the response. We can make the point, as you suggested, that as shown in Jones and Mann, the reconstructions are broadly consistent with the vast majority of simulations that have been done...

I don't think it should be a problem waiting about a week for Scott to resubmit (in time for the Osborn et al '04 paper to have been submitted). We still need to give Malcolm and Ray a chance to get back w/ any additional comments, if they have them...

cheers,

mike

At 07:00 AM 6/16/2004, Tim Osborn wrote:

> Dear Scott et al.
>
> the manuscript reads well - the results section in particular does a good job at presenting the sequence of many experiments in a logical and structured way.
>
> We've combined all our (me, Keith and Phil) comments together, and put them in the attached files (one for the manuscript, one for the response to the editor).
>
> Many are simple changes. Some are questions/comments for you, that I've put in CAPITALS. I've also written an improved description of the MXD data.
>
> And the "Osborn et al. (in preparation)" paper that describes the gridding and low-frequency aspects of the MXD data (as well as our "local" calibration of it) is now referred to as Osborn et al. (2004, submitted to Global and Planetary Change). It is not, in fact, submitted as I write, but should be very soon - a full draft is complete and I have comments from Phil and Fritz, and Keith is halfway through providing his comments. I'll let you know as soon as its submitted - it would be preferable if you could hold off returning your revised manuscript until we have actually sent off Osborn et al. - it should be done by the end of the week. Then "Osborn et al. (submitted)" will be true!
>
> Cheers
>
> Tim
>
> At 19:15 28/05/2004, Scott Rutherford wrote:
>
> > Dear All,

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Attached is a revision of the Northern Hemisphere comparison for J. Climate. Also attached is a reply to reviewers. (both microsoft word format)

I've been getting extensions for the submission of the revision and would like to try to get it in around June 15. If you want to make suggestions/comments directly in the text, please use Microsoft Word's "track changes" feature if possible. There are a few highlighted parts that need particular attention.

Please let me know if you have question or difficulty with the files.

Regards,

Scott

Scott Rutherford

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sunclock: http://www.cru.uea.ac.uk/~timo/sunclock.htm

Professor Michael E. Mann

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From: Raymond S. Bradley
To: mann@multiproxy.evsc.virginia.edu; mhughes@ltrr.arizona.edu; srutherford@virginia.edu; frank@geo.umass.edu
Subject: fyi
Date: Wednesday, May 23, 2001 11:30:31 AM

Once refs are fixed, I will send this to Science:

S. F. Singer states, "...the overwhelming balance of evidence shows no appreciable warming trend in the past 60 years; hence, it is unlikely to be significant in the future." (1). He is wrong on both counts. The evidence for warming over the last 60 years is unequivocal. The change in temperature has led to a major reduction in the mass of alpine glaciers in almost all parts of the world (2-4), an increase in permafrost thawing at high latitudes (5) and at high altitudes (6), a reduction in the extent and thickness of Arctic and Antarctic sea-ice (7-9), later freeze-up and earlier break-up dates of ice on rivers and lakes (10), an increase in the calving rate of Antarctic ice shelves (11). There is no evidence or reason to think that these systems have a lag response to warming of 50 years or more (e.g. 12). There have also been shifts in the distribution of plant and animal species, latitudinally and altitudinally (13, 14), changes in the phenology of plant leafing and flowering (15) and the storage of significant quantities of heat in the near-surface ocean (16) as well as an overall rise in sea-level driven by both continental ice melting and a steric change due to the increase in overall ocean temperature (17). Thus, regardless of arguments over instrumental versus satellite-based estimates of warming in recent decades (18) there are multiple indicators of warming in the 20th century that paint a vivid picture of the global-scale environmental consequences of the temperature increase. Going forward in time, the accelerating rate of fossil fuel consumption will drive global temperatures to levels not seen in at least a millennium, and probably higher than for many thousands of years. This scenario will play out in a world whose population will increase by 50% over the next century. Singer and like-minded colleagues can continue to ignore the overwhelming evidence all around them or continue to bury their heads in the sand. If they do so, they would also note remarkable increases in borehole temperatures over the last millennium (19, 20) another diagnostic indicator of all they seek to deny.

References

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5. permafrost thawing at high latitudes
6. permafrost thawing at high altitudes
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Climate System Research Center Web Page:
<http://www.geo.umass.edu/climate/climate.html>
Paleoclimatology Book Web Site (1999):
http://www.geo.umass.edu/climate/paleo/html

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From: Michael E. Mann
To: Malcolm Hughes; rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; Scott Rutherford
Cc: mann@virginia.edu
Subject: Re: abstract to EGS Spring "02
Date: Thursday, January 10, 2002 9:49:42 AM

HI Malcolm,

Sounds good to me. Will make the chance and submit,

mike

At 09:47 AM 1/10/02 -0700, Malcolm Hughes wrote:
>I's like a week in France, but, no time. Have fun!
>The abstract ooks great to me, most recent proposed author order also fine. I
>do however, have a question about the passage :
>" the possible dynamical underpinnings of the "Little Ice Age"--a period
>during which temperatures in certain regions, such as Europe, appear to have
>exhibited a cooling that is significantly larger than that estimated in both
>empirical climate reconstructions and model simulations of past temperatures
>at the hemispheric scale"
>how about? :
>"the possible dynamical underpinnings of the "Little Ice Age" - a period of
>much stronger cooling in certain regions, such as Europe, than elsewhere at
>the hemispheric scale, as estimated in both empirical climate reconstructions
>and model simulations"
>Cheers, MalcolmMalcolm Hughes
>Professor of Dendrochronology
>Laboratory of Tree-Ring Research
>University of Arizona
>Tucson, AZ 85721
>520-621-6470
>fax 520-621-8229

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To: Malcolm Hughes; rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu; Scott Rutherford; dshindell@giss.nasa.gov; gavin@isis.giss.nasa.gov
Subject: Re: "Perspective"
Date: Monday, July 15, 2002 10:48:48 AM

HI Malcolm,

Thanks for the comments. I sent the draft off on Friday, as required by the deadline, but I'll try to incorporate your suggestions into the revisions,

mike

At 10:47 AM 7/15/02 -0700, Malcolm Hughes wrote:
>Dear Mike - sorry I couldn't get back to you by Friday -
>life is a little frantic as I leave for almost a month on
>Wednesday.
>I like the article, and have only a few minor suggestions.
>These are shown in the attached "track changes" version
>of the mss.Some need a little explanation, so here goes:
>
>Second para: "They only provide information in subpolar
>terrestrial regions.." - it doesn't seem too subpolar here,
>and good material relevant to this (regular douglas fir, like
>those here) are being sampled by Stahle as far south as
>Oaxaca (17degrees N). The change I suggest is a little
>denser, but I think it captures the reality better. In the next
>sentence, I suggest that if you were going to stick with
>"poorly representative" you ought to really also say, "but
>better than anything else". I hope the change I suggest
>gets round this.
>I also suggest a change to the sentence about "Most tree-
>ring data describe warm-season conditions...". I think it's
>probably wrong - we have more moisture-sensitive sites
>from regions where winter ppt is important in the western
>US alone, than all the summer-temp responding
>Schweingruber chronologies for the world. I think the
>suggested change deals with this.
>End of second paragraph - I think that precise annual
>dating need not be difficult in regions where they have
>replicate cores - it's just that most ice core folks didn't get
>the point. The suggested change might help.
>There are two or three typo- type things later in the mss.
>Hope this helps! Cheers, Malcolm
>
>
>
> >
> > Dear All:
> >
> > Attached is (final?) draft of a "perspective" article I've been
> > solicited to write for Science, along with an accompanying Figure. I'd
> > appreciate any comments or feedback you might be able to provide
> > before I send this off to Science. I'd plan to send if off Friday, so
> > if you can get back to me within the next day or so that would be
> > particularly helpful.
> >
> > Thanks in advance,

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> >
> > mike
> > _____
> > _____
> > Professor Michael E. Mann
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> > Charlottesville, VA 22903
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> > _____
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>Tucson, AZ 85721
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From: Malcolm Hughes
To: Michael E. Mann
Subject: Re: one thought
Date: Monday, January 20, 2003 12:30:19 PM

I still don't know. If it were carbon dioxide, one would expect similar patterns on other continents in similarly arid mountain ranges, but they have not been found. This problem really bothers me, so I am worrying away at it, trying to get a more refined definition fo the conditions under which this occurs. It's worth noting that, some others (e.g. Lisa Graumlich) did not find the same thing in some of the datasets we are using - she used less conservative standardization.
Paul Sheppard in our lab is looking again at the hypothesis that there was fertilization by nitrogen pollution from central and southern California, by direct analyses of wood chemistry, but he's some way from results. Hapy New Year! MAlcolm

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From: Michael E. Mann
To: Malcolm K. Hughes
Cc: Michael E. Mann; Scott Rutherford; Ray Bradley
Subject: Re: ESH proposal
Date: Tuesday, January 01, 2002 12:28:34 PM

Hi Malcolm,

(happy New Year to everyone!)

Thanks for the quick response.

I agree entirely, the extension of the temperature reconstructions back in time is *very* important, and I see the SLP reconstructions as occuring in parallel w/ that.

The only tricky thing is in deciding exactly how to divide our description of all this between "previous work" that is in progress associated w/ our current funding (we did promise these extensions back in time, but we have to try to anticipate what we'll actually have done by the end of next summer, and what is reasonable to propose as "new" research to be funded. Personally, I don't think we can be held to everything we promised, so I think we can take a bit of liberty w/ what we're actually calling "new"...

So we have to finesse this issue a bit as we iron out the proposal, and I've tried to sketch out where I think the break between these two most naturally falls, but this is free to evolve...

Re, Luterbacher et al, etc. Yes, I think that would be a great idea. Can you perhaps work on that angle, drafting some sentences along these lines and fitting them into the appropriate place in the proposal, and contracting Juerg (on all our part) soliciting his potential interest in collaboration?

Will be available all week, so feel free to email or phone (home) me,

mike

At 08:16 PM 12/31/01 -0700, Malcolm K. Hughes wrote:
>Dear Mike - a first quick question - it's clearly a good idea to move on to
>circulation, etc., but we should probably also plan to continue extending the
>temperature reconstructions back in time. WHat do you think? Another
>point is that a similar collaboration to that you propose with Ed Cook
>could almost certainly be set up with Wanner and Luterbacher, probably at
>no cost. CHeers, Malcolm
>
>
>
>Quoting "Michael E. Mann" <mann@virginia.edu>:
>
> > Dear Scott (et al):
> >
> > I won't blame you if you don't even look at this email until tomorrow.
> > However, I wanted to get this in your court as soon as possible to give
> > us
> > as much of a head start in finalizing this as possible.
> >
> > Attached is a (rough) draft of the proposal.

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> >
> > A fair amount of work still needs to be done. I have put place-holders
> > and/or captions for figures that I have in mind to show, but we can
> > include
> > the actual figures later (better to keep the document small while we
> > iterate). The important thing is to get a sense of the over all strategy
> >
> > and emphasis I'm proposing, so you can provide any feedback on the big
> > picture as soon as possible.
> >
> > I'm requesting that Scott act from here on as the coordinator (Scott:
> > please let me know if this is a problem). Scott can incorporate
> > subsequent
> > changes and comments, both his and yours, into one central copy of the
> > proposal, and deal w/ format issues, etc. Scott: I'm forwarding you
> > separately the NSF proposal format guidelines. We need to coordinate w/
> > Neal Grandy (nrg2p@virginia.edu) regarding budgets & statements of work,
> >
> > etc., and need to get our CVs and C&Ps together in a format acceptable
> > by
> > NSF Fastline (best to get these to Scott in the form of word files, and
> > let
> > Scott render these in appropriate pdf format--NSF is very particular
> > about
> > which pdf documents are and are not acceptable (I've forwarded a
> > relevant
> > email).
> >
> > I will forward the various emails/letters I get form collaborators to
> > Scott
> > to be included in our proposal. As I see it, we need to have this in
> > close-to-final-shape by next sunday (when I'm hoping that Ray, Scott,
> > and I
> > can meet in Amherst: Ray, Scott--does this work???), so we can finalize
> > the
> > paperwork and get the budgets in on time, etc.
> >
> > Please let me know if any question/comments.
> >
> > Happy New Year,
> >
> > Mike
> >
> > _____
> > Professor Michael E. Mann
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From: Raymond S. Bradley
To: mann@multiproxy.evsc.virginia.edu; mhughes@ltrr.arizona.edu
Subject: budget issue
Date: Friday, January 04, 2002 12:10:56 PM

I see from your proposed budget notes that you propose to have 2 @50% time graduate students at UVa....I wonder if we can justify 2 grads, a 50% post-doc, plus 4 months PI time/year (yours @ 2mo/year, & presumably MKH & me @ 1 month...?). Rough guess is that this will be ~$95-100K/year in personnel costs....plus fringe & IC...My guess is that reviewers will regard this as overweight on personnel time...apart from it adding up to ~$430k over 3 years
What do you'all think?

ray

Raymond S. Bradley
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Climate System Research Center: 413-545-0659
Climate System Research Center Web Page:
<http://www.geo.umass.edu/climate/climate.html>
Paleoclimatology Book Web Site (1999):
http://www.geo.umass.edu/climate/paleo/html

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From: Michael E. Mann
To: rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu
Subject: draft of ESH proposal
Date: Friday, August 13, 2004 1:39:23 PM
Attachments: nsf-esh04.doc

Dear Ray, Malcolm

Attached is a draft of the proposal to be submitted to ESH in October. Please pay particular attention to those places where you've been flagged (yellow highlighted "Malcolm" and "Ray").

I'm hoping to get comments back from everyone by labor day, so I can begin to produce a final version, and can start working out budgets...

Feel free to ignore this until after the weekend!

Thanks,

Mike

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PROJECT SUMMARY

Mechanisms of Climate Change and Variability During the Late Holocene

The proposed project will build on previous efforts to both reconstruct and model patterns of climate variability during past millennia. This project will make use of detailed proxy-based reconstructions of large-scale surface temperature and atmospheric circulation patterns over the past two millennia. Comparisons will be made with forced climate model simulations in collaboration with colleagues at three different climate modeling centers (NASA/GISS, NCAR, and ECBILT) to elucidate plausible mechanisms underlying patterns of climate variability over this timeframe. Concurrent with these activities, preliminary extensions of climate reconstructions to the past 3-5 millennia will be attempted based on the use of coarsely resolved proxy climate indicators. The ***Intellectual Merit*** of the project is characterized by three inter-related scientific research components:

1. Empirical proxy-based climate reconstruction: This component will involve (a) preliminary extensions of large-scale temperature reconstructions over the past 3-5 millennia based on the careful consideration of a restricted set of less temporally resolve proxy temperature records in conjunction with (b) testing of sparse sampling strategies for large-scale climate reconstruction based on the use of 'pseudoproxy' networks derived from long climate model simulations (see "2" below).

2. Modeling of past climate changes: This component will involve a set of experiments designed to assess the underlying external and dynamical factors consistent with reconstructed patterns of past climate change. These experiments will include (a) specified SST forcing of atmosphere-only models (GISS and NCAR) using proxy-reconstructed of observed SST changes; (b) external radiative forcing of an atmospheric model with interactive stratospheric photochemistry and mixed-layer ocean (GISS) and (c) external radiative forcing of a fully coupled ocean-atmosphere model (NCAR; ECBILT). These modeling experiments will also be used in tests of proxy network sampling strategies (see "1" above).

3. Model/Data comparison: This component will involve the quantitative assessment of the extent to which model simulations can explain observed patterns of changes in surface temperature, atmospheric circulation, and continental drought. These assessments will draw upon established tools including multivariate frequency-domain analyses, pattern correlations, and composite analysis.

Broader Impacts of the proposed research involve significant expected progress towards addressing key outstanding issues regarding the spatial and temporal details of past changes in the Earth's climate, the factors underlying those changes, and implications for our understanding of future climate change. Among the primary issues to be investigated are:

1) The role of combined natural and anthropogenic radiative forcing in explaining large-scale temperature changes over the past 1000-2000 years

2) The nature of the response of tropical Pacific coupled ocean-atmosphere dynamics to changes in external radiative forcing.

3) The role of tropical Pacific climate changes in explaining larger-scale patterns of climate (surface temperature and atmospheric circulation) variability and change in past centuries

4) The role of both tropical Pacific and tropical Atlantic SST forcing in explaining patterns of North American drought in past centuries

5) The nature of the response of the Northern and Southern Annular modes (NAM and SAM) to changes in external radiative forcing.

6) The role of changes in the NAM and SAM in explaining observed patterns of large-scale climate (surface temperature and atmospheric circulation) variability and change in past centuries

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PROJECT DESCRIPTION

Mechanisms of Climate Change and Variability During the Late Holocene

Results from prior NSF support

Multiproxy Climate Reconstruction: Extension in Space and Time, and Model/Data Inter-comparison
Earth Systems History (ESH) NOAA/NSF joint (NOAA NA96GP0404)
1/1/99 - 8/31/02, $382,000 (U.Va award), P.I.: M.E. Mann, co-investigators: R.S. Bradley, M.K. Hughes

This project built on previous work by Mann and colleagues reconstructing large-scale surface temperature patterns in past centuries (Mann et al, 1998). Seasonally-resolved versions of the Mann et al (1998) surface temperature reconstructions (Mann et al, 2000b) were produced, and proxy climate reconstructions were analyzed for insights into the nature of long-term internal climate variability (e.g. Braganza et al, 2003; Covey et al, 2003) including analysis of modes of climate variability related to the El Nino/Southern Oscillation or 'ENSO' (Mann et al, 2000ab; Mann 2001ab), the North Atlantic Oscillation or 'NAO' (Cullen et al, 2001; Mann 2001ab; Mann 2002a; Cook et al, 2002), and multidecadal North Atlantic ocean-atmosphere processes (Delworth and Mann, 2000). The role of external forcing in climate changes in past centuries was examined at the hemispheric-mean scale (Mann 2000; Mann, 2002b; Gerber et al, 2002) and in terms of spatial patterns of forced response (Shindell et al, 2001; Waple et al, 2002). The possible role of biases related to dendroclimatic processing and standardization issues in paleoclimate reconstruction were examined (Mann et al, 2000b; Mann and Hughes, 2002). Discrepancies between borehole and proxy-based temperature reconstructions were examined, and signal-detection techniques were used to produce optimal borehole surface temperature estimates (Mann et al., 2003).

Methodological refinements of the original Mann et al (1998) climate field reconstruction (CFR) approach were introduced (Mann and Rutherford, 2002; Rutherford et al, 2003), and the fidelity of CFR was tested using networks of "pseudoproxies" obtained by resampling the instrumental surface temperature record using sparse networks of data of varying size and additive noise level (Mann and Rutherford, 2002). These tests supported conclusions from previous studies regarding the level of statistical skill in proxy-based climate reconstruction, placing limits on the potential skill and suggesting alternative strategies for improved proxy-based surface temperature pattern reconstructions. The issue of whether or not calibration of proxy data against non-stationary late 20th century instrumental data may produce a biased reconstruction was addressed through analyses of control and forced integrations of the Geophysical Fluid Dynamics Laboratory (GFDL) R30 coupled ocean-atmosphere model and instrumental temperature records, establishing that climate reconstructions of the 19th and previous centuries are unbiased when the 20th century is used as a calibration period (Rutherford et al., 2003).

This project resulted in more than 20 peer-reviewed publications. Results from this project were featured prominently in several chapters of the 2001 IPCC report, and the numerous resulting datasets were made publicly available through the NOAA World Data Center for Paleoclimatology. This proposal has also helped support Brad Adams' and Zhihua Zhang's progress towards their dissertations in the Department of Environmental Sciences at the University of Virginia, and has furthered the post-graduate scientific development of University of Virginia postdoctoral researcher Dr. Scott Rutherford.

Reconstruction and Analysis of Patterns of Climate Variability Over the Last One to Two Millennia
Earth Systems History (ESH) NOAA/NSF joint (NOAA NA16GP2913)
9/1/02 - 8/31/04, $315,000 (U.Va award), P.I.: M.E. Mann, co-investigators and collaborators: R.S. Bradley, M.K. Hughes, T. Delworth, R. Stouffer, M. Cane, S. Zebiak

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This project, currently in progress, has built on previous proxy climate reconstruction and model/data intercomparison work by Mann and colleagues. Among the accomplishments thusfar are the development of a hybrid frequency domain approach (Rutherford et al 2004) to climate field reconstruction, which has been found to yield verification scores that are comparable or better than the non-hybrid approach (Rutherford et al, 2004), and allows for the inclusion of proxies with lower than annual resolution (e.g., lake and high-resolution ocean sediments) in climate field reconstruction (CFR).

In collaboration with colleagues at the Climatic Research Unit (CRU) of the University of East Anglia, an analysis was performed of the sensitivity of Northern Hemisphere surface temperature reconstructions to different methods and proxy networks (Rutherford et al, 2004) and have applied the 'RegEM' Climate Field Reconstruction (CFR) technique developed under a prior award to the improved reconstruction of proxy-based continental drought in the conterminous United States in past centuries (Zhang et al, 2004). In collaboration w/ colleague P. Jones of CRU, an extension of proxy-based estimates of hemispheric and global-mean temperature changes back to AD 2000 has been performed (Mann and Jones, 2003), and in collaboration w/ colleagues N. Andronova and M. Schlesinger, these hemispheric reconstructions have been used to assess the sensitivity of the climate system to radiative forcing based on comparisons with forced EBM model simulations (Andronova et al, 2004). Progress has also been made in elucidating possible dynamical mechanisms consistent with reconstructed climate histories. This progress includes the analysis of the role of radiative (volcanic and solar) forcing of the Arctic Oscillation on past seasonal temperature changes based on experiments with a stratosphere-resolving climate model in collaboration with D. Shindell and G. Schmidt of NASA/GISS (Shindell et al, 2003, 2004), and publication of an analysis describing a statistical linkage between long-term volcanic forcing and ENSO-related climate variability (Adams et al, 2003). In collaboration with Columbia Univ. colleagues M. Cane and S. Zebiak, and A. Clement of University of Miami, a compelling theoretical mechanism for natural (volcanic and solar) radiative forcing of the El Nino/Southern Oscillation (ENSO) over the past 1000 years has been described (Mann et al, 2004), explaining both the empirical evidence of linkages between explosive volcanism and El Nino events detailed by Adams et al (2003), and the evidence for century-scale variations in tropical Pacific climate conditions in past centuries. These changes can potentially explain long-term changes in drought conditions in the western U.S. over the past 1000 years, which hold implications for assessing present-day drought vulnerability to radiative forcing of climate.

Heading into the final stages of the project, the groundwork has been laid for proceeding with detailed proxy-based reconstructions of global patterns of seasonal Sea Level Pressure and Surface Temperature spanning the past two millennia, based on the revised systematic methodology described by Rutherford et al (2004) to assimilate networks of proxy indicators into CFR. These reconstructions are based on dynamically constructed proxy networks based on an appropriate set of a priori criteria and screening process targeted to produce optimal verification scores for the particular seasonal window and climate field of interest. The resulting reconstructions will be available for analysis by the completion of this project. Concurrently, we are making progress on the analysis of networks of synthetic proxy data or 'pseudoproxies' to test the CFR approach developed under our previous award.

This project produced 14 peer-reviewed publications published, in press, or submitted at the time of this proposal, including two recent reviews of climate change during the late Holocene years (Jones and Mann, 2004; Schmidt et al, 2004). Several sets have been made available to the NOAA World Data Center for Paleoclimatology, and the graphical interface designed for selecting proxy networks in CFR in this project will be made available upon completion of this project. The masters thesis of University of Virginia graduate student Brad Adams, which was supported by this project, resulted in a high profile article in *Nature* (2003) detailing empirical proxy-based evidence for a relationship between explosive tropical volcanic forcing of climate and probability of El Nino events over the past several centuries. This project has also supported the progress of Zhihua Zhang's towards his dissertations in the Department of Environmental Sciences at the University of Virginia, and has furthered the professional development of

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University of Virginia postdoctoral researcher Dr. Scott Rutherford, who has since taken a faculty position at Roger Williams University in Rhode Island.

Remote Observations of Ice Sheet Surface Temperature: Toward Multi-Proxy Reconstruction of Antarctic Climate Variability
NSF Office of Polar Programs, Antarctic Oceans and Climate System Program
9/02 - 8/05, $133,000 (U.Va award), P.I.s: M.E. Mann (Univ. of Virginia), E. Steig (Univ. Washington), D. Weinbrenner (Univ. Washington)

This project is aimed at reconstructing patterns of climate variability in Antarctica over the past one to two millennia based on calibration of annual resolution ice core oxygen isotopes against modern instrumental data. This involves the development of statistically reliable, spatially extensive estimates of surface temperature variations over the past century, based on cross-calibration of ground-based instrumental and satellite data. An 'infilled' version of the instrumental surface temperature record available over Antarctic during the 20th century has been produced using the covariance-based spatiotemporal infilling techniques described by Rutherford et al (2003). This record has, in turn, been statistically merged with satellite skin temperature measurements over Antarctic available during the past two decades to yield a spatially-extensive long-term instrumental surface temperature dataset. The remainder of the project will be devoted to using this dataset to calibration currently available long-term annually resolved ice core oxygen isotopic records to yield a preliminary reconstruction of long-term temperature trends in Antarctica.

A manuscript describing Antarctic surface temperature reconstructions over the historical period (Steig, Schneider, Mann, Rutherford, and Weinbrenner) is currently in preparation. This proposal has supported in part the professional development of U.Va graduate student Zhihua Zhang.

1. Introduction

Considerable progress has been made over the past several years with regard to our knowledge and understanding of the climate variability of the period spanned by the past one-to-two millennia (see Jones and Mann, 2004). One important development has been the generation of multiple independent (or quasi-independent) proxy-based reconstructions of hemispheric and global mean temperature changes in past centuries (see Mann et al, 1998;1999; Jones et al, 1998; Briffa et al, 1998; Briffa and Osborn, 1999; Crowley and Lowery, 2000; Huang et al, 2003; Folland et al, 2001; Jones et al, 2001; Mann 2001a; Esper et al, 2002; Mann and Jones, 2003; Crowley et al, 2003) and numerous independent attempts to model hemispheric mean temperature changes using climate models of varying complexity forced by estimated past radiative forcing histories (Rind et al, 1999; Free and Robock, 1999; Crowley, 2000; Bertrand et al., 2002; Gerber et al, 2003; Bauer et al, 2003; Hegerl et al, 2003; Goose et al, 2003; Gonzales-Rouco et al, 2003, Crowley et al, 2003; Andronova et al, 2004; Crowley, 2004). Comparisons of model and observations at the hemispheric-mean scale yield a generally consistent picture (Jones et al, 2001; Mann et al, 2003; Crowley et al, 2003; Jones and Mann, 2004; Schmidt et al, 2004), suggesting anomalous late 20th century warmth in the context of at least the past one-to-two millennia (Mann et al, 2003; Jones and Mann, 2004; Rutherford et al, 2004; Cook et al., 2004; Crowley, 2004) that appears to be associated with anthropogenic forcing (Crowley, 2000; Crowley et al, 2003; Hegerl et al, 2003; Andronova et al, 2004).

Insights into *regional* responses and the underlying dynamical mechanisms are equally, if not more, important to our understanding of past climate changes. Significant progress has also been made in recent years in attempting more spatially and seasonally-resolved temperature reconstructions (Mann et al, 2000; Rutherford et al, 2004), and targeted reconstructions for key specific regions such as Europe (e.g. Luterbacher et al, 2004) and the tropical Pacific (e.g. Evans et al, 2003). Analyses have been performed addressing the influence of statistical methodology and type of proxy network used on spatial temperature

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reconstructions, suggesting that alternative reconstructions appear consistent when seasonal and spatial sampling details are controlled for (Rutherford et al, 2004).

Recent efforts have also emphasized proxy reconstructions of modes of climate variability such as such as the North Atlantic Oscillation (NAO)/Arctic Oscillation(AO) (Appenzeller et al, 1998; Luterbacher et al., 1999; Schmutz et al, 2000; Cullen et al., 2001; Mann, 2002a; Cook et al., 2002a; D'Arrigo et al, 2003b), the Antarctic Oscillation (AAO) (Jones and Widmann, 2003), the PDO index (Minobe, 1997; Biondi et al., 2001, Gedalof et al, 2002), the 'Atlantic Multidecadal Oscillation' or 'AMO' (Delworth and Mann, 2000; D'Arrigo et al, 2003a; Gray et al, 2003; 2004) and indices of the El Nino/Southern Oscillation including the SOI (Stahle et al., 1998) and Niño3 (Mann et al., 2000a,b; Evans et al., 2002). In addition, detailed reconstructions of continental drought from tree-ring data have been performed in recent years (Cook et al, 1997;1999; Zhang et al, 2004).

These regionally and seasonally detailed reconstructions, and reconstructions of particular modes of climate variability can, in conjunction with regionally-focused climate modeling experiments, allow us an opportunity to infer the dynamical mechanisms underlying observed patterns of past climate variability. Experiments using the NASA/GISS model suggest that the dynamical response of the AO/NAO or "Northern Annular Mode" (NAM) to past radiative forcing changes can explain some important features in reconstructed climate changes of past centuries (Shindell et al, 2001, 2003, 2004). The response of the NAM to solar forcing, for example, may explain the greater cooling observed in Europe during the 17th/early 18th century height of the European "Little Ice Age" (Shindell et al, 2001), while the seasonally-opposite response of dynamically-induced winter warming and radiative induced summer cooling emphasizing the extratropical continents (Shindell et al, 2003, 2004), may explain evidence of enhanced summer extratropical cooling during certain intervals in the past (Mann et al, 2003; Mann and Schmidt, 2003; Shindell et al, 2003, Rutherford et al, 2004). Changes in the North Atlantic meridional overturning circulation in response to may also be important on multidecadal and multi-century to millennial timescales (Bond et al, 2001; Waple et al, 2002; Goose et al, 2003).

The possible role of ENSO-scale feedbacks has not been incorporated into model estimates of externally-forced hemispheric or global temperature changes in past centuries (e.g., Rind et al, 1999; Crowley, 2000; Goose et al, 2003). Coupled ocean-atmosphere models used thusfar in forced millennial simulations (Gonzales-Rouco et al, 2003; Goose et al, 2003) do not faithfully reproduce the Bjerknes feedbacks governing coupled ocean-atmosphere variability in the tropical Pacific (though simulations in progress with the NCAR CCSM3 coupled model may realistically resolve such variability--Amman et all, pers. comm.). However, simulations employing the low-order 'Cane-Zebiak' model (Zebiak and Cane, 1997) model of the tropical coupled ocean-atmosphere dynamics using estimated tropical solar and volcanic radiative forcing over the past millennium, reproduce (Mann et al, 2004) some important empirical observations, including an observed relationship between explosive tropical volcanic forcing and the enhanced probability of ENSO conditions (Adams et al, 2003), and regarding climate variability in past centuries. They suggest... ENSO: Evans, Cobb, Waple et al, Adams et al, Mann et al (2004) and evidence from fossil corals in the central tropical Pacific spanning various intervals of the past 1000 years for an El Niño-like state during the otherwise generally cold 17th century (e.g. Crowley, 2000; Mann et al, 2003) and a La Niña-like state during the otherwise relatively mild 12th/13th centuries (Crowley, 2000; Mann et al, 2003). These results suggests a possible damping of the hemispheric-mean temperature changes estimated in the previous simulations discussed above that resolve possible ENSO-scale responses (see Mann et al, 2004) and may help to explain apparent evidence that extratropical temperature changes in past centuries (e.g. Esper et al, 2002) have been greater in amplitude than tropical (Hendy et al, 2002) or full hemispheric-scale (e.g. Mann et al, 2003) temperature changes.

Possible such changes in tropical Pacific may provide an understanding of past changes in patterns of continental drought. Verschuren et al (2000) provide lake-level evidence in equatorial east Africa (Kenya) for peak wet conditions during the mid-7th to the mid-18th centuries, and dry conditions during the early (11th-13th) centuries of the millennium, reminiscent of anomalies typically associated with El Niño and

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La Niña conditions, respectively. A similar pattern of drought in earlier centuries and wet conditions in later centuries in the desert southwest of North America (Woodhouse and Overpeck, 1998) also favors interpretation in terms of the radiatively forced changes in ENSO in past centuries described by Mann et al (2004).

Within a time frame of the next several half year, more spatially extensive, seasonally-resolved reconstructions of surface temperature and atmospheric circulation over the past 1-2 millennia currently under preparation by Rutherford and coworkers, will be submitted for publication and available for analysis and comparison with reconstructions of related climate fields (e.g. North American summer drought reconstructions) and climate model simulation results. In conjunction with concurrent advances in modeling of climate changes on this timeframe, including experiments using high resolution coupled ocean-atmosphere models capable of resolving ENSO-scale responses models that resolve coupled stratospheric/tropospheric processes, the detailed analysis of these reconstructions will provide an as-yet unparalleled opportunity to both characterize and understand, on a more fundamental level, the climate variability of the late Holocene. Such assessments may not only provide additional insight into the factors underlying past climate variability and change, but in addition may hold important implications for our understanding of possible future climate change.

2. Previous Work

2.1. Proxy-Based Reconstructions Surface Temperature, Sea Level Pressure, and Continental Drought

Building on earlier work (e.g. Bradley and Jones, 1993; Overpeck et al, 1997; Jones et al 1998; Mann et al, 1998; Briffa et al, 1998), Climate Field Reconstruction (CFR) techniques have recently been applied to more spatially extensive and seasonally resolved proxy data to yield seasonal reconstructions of surface air and sea surface temperature patterns spanning the past several centuries (Mann et al, 2000; Evans et al, 2002; Rutherford et al, 2004). The spatially- and seasonally-resolved information in these reconstructions (Figure 1) has formed the basis for a number of studies seeking to identify the signature of expected patterns of response to known forcings of past climate (Shindell et al, 2003; 2004; Braganza et al, 2003; Adams et al, 2003).

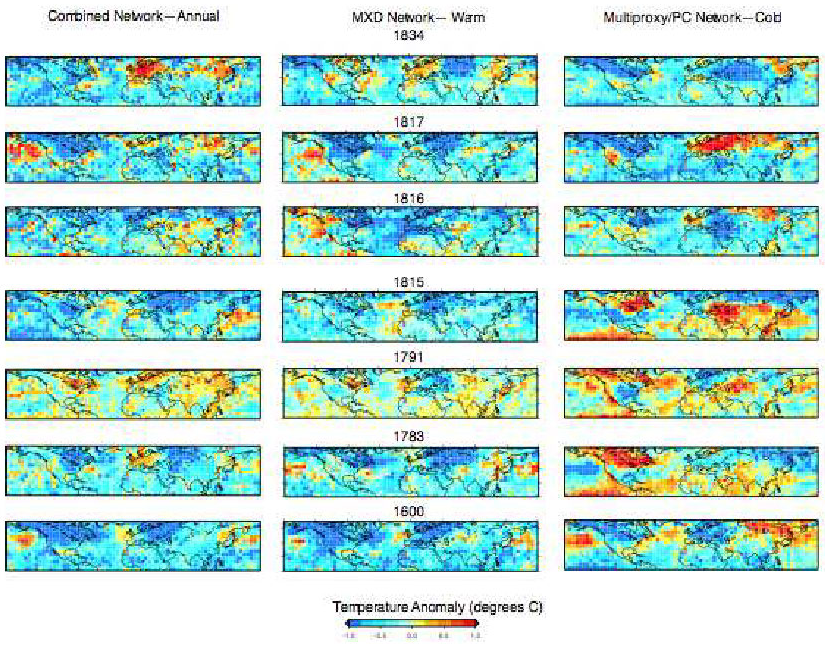

FIGURE 1 *Maps of the full field reconstruction for interesting years using the three different proxy networks (multiproxy/PC, MXD and Combined) to reconstruct three seasonal targets. The years shown are the following: 1600, the year of the Huaynaputina (Peru) eruption; 1783, the year of the Laki eruption in Iceland; 1791, an El Nino year (Quinn and Neal 1992); 1816, the "Year Without a Summer" following the Tambora eruption in 1815; and 1834, an exceptionally warm year in Europe (Mann et al., 1998).*

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Further building on these developments, Mann and colleagues are in the process of preparing a more extensive set of reconstructions of seasonal (cold-and warm-half year) large-scale surface temperature and sea level pressure spanning more than the past millennium. These reconstructions are based on a considerably expanded database (Figure 2) from that used by Mann and coworkers in previous years including a large number of previously unused annually-resolved tree-ring, coral, and ice core proxy records, and other lower-resolution, decadally resolved proxy indicators. An expansion of the data base has been accomplished by including additional proxy records that have been developed in the recent past, and by using the hybrid calibration procedure discussed below, which allows for the use of mid-resolution data not included in the previous multiproxy reconstructions (e.g., decadally, but not annually resolved, lake and sediment core data, and other more coarsely resolved proxy records) that can be used to better resolve low-frequency patterns of variance, and allows for the inclusion of dendroclimatic climate indicators in the International Tree Ring Data Bank (ITRDB) that were previously excluded from the proxy network because of their poor retention of low-frequency variability. Relaxing that requirement permits a more than three-fold increase in the usable tree-ring series from the ITRDB than were used by Mann et al (1998). In addition, we are making use of an age banded version (Osborn et al, 2004) of the maximum latewood density (MXD) network originally developed by Briffa and coworkers (Briffa et al, 1996;1998;2001) developed to improve the retention of low frequency climatic information that might otherwise be reduced or removed by conventional standardization methods during chronology development.

he recently developed 'hybrid' methodology described by Rutherford et al (2004) is currently being used to assimilate these networks of annual and decadal resolution proxy indicators into CFR in separate high (interannual) and low-frequency (decadal and longer period) bands. By dynamically building different proxy networks using a variety of selection criteria and a screening process tailored to a particular field (surface temperature or sea level pressure), season (annual, cold-season or warm-season), and frequency band (low or high), proxy networks are chosen to produce optimal seasonal climate field reconstructions (as determined from verification skill diagnostics) in these analyses. Based on initial analyses, these reconstructions are expected to exhibit greatest skill at regional scales during the past four or five centuries, while spatially coarse trends are expected one to two millennia back in time. The surface temperature reconstructions make use of the spatially infilled instrumental surface temperature record of Rutherford et al (2003) available back to 1856 (similar analyses have been performed by Smith et al, 1996; Kaplan et al, 1998), for calibration, while the sea level pressure reconstructions make use of the infilled instrumental Sea Level Pressure record of Zhang and Mann (2004), available back to 1871. The resulting reconstructions will be completed by the beginning of the proposed project. Preliminary results are shown in Figure 3.

[FIGURE 2-**SCOTT/ZHANG** SHOW MAP OF REVISED PROXY NETWORK!]

[FIGURE 3--**SCOTT/ZHANG** SHOW PRELIMINARY RESULTS FROM SURFACE TEMPERATURE AND/OR SLP RECONSTRUCTIONS]

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Zhang et al (2004) have recently produced spatially complete reconstructions of the Palmer Drought Severity Index (PDSI) over the conterminous U.S. back to AD 1700 (see Figure 4), complimenting previous analyses by Cook and coworkers (Cook et al 1997;1999). These more recent drought reconstructions make use of a statistical approach known as "Regularized Expectation Maximization" or "RegEM" with some preferred statistical properties (Schneider, 2001; Rutherford et al, 2003; 2004), achieving a high level of verified statistical skill (Zhang et al, 2004). While extensions of these reconstructions back over the past millennium are currently underway, at least for certain regions such as the western U.S. (E. Cook, pers. comm.), these currently available continental-scale reconstructions provide a baseline for the evaluation of detailed patterns of continental North American drought over the past several centuries. Longer millennial-scale, but more regionally-isolated evidence of drought variations in North America are available from lake sediment data (Laird et al, 1996).

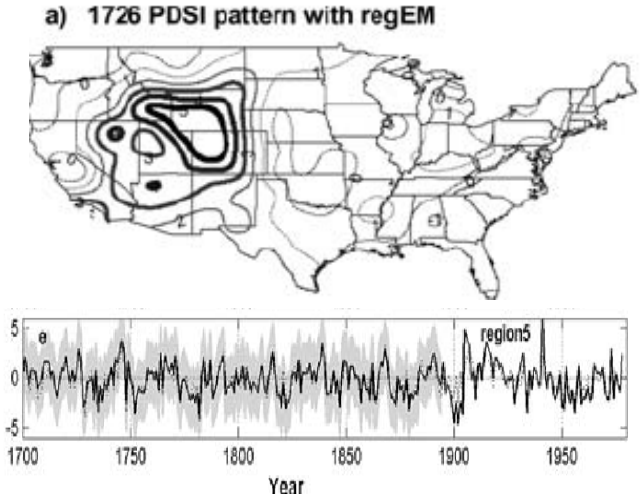

FIGURE 4 *Reconstructions of North American Palmer Drought Severity (PDSI) Index from Zhang et al (2004). Shown is the spatial PDSI reconstruction for a particular year (top) and the time series for the spatial region (region '5' from Zhang et al) spanned by the desert southwest of the U.S. (bottom--uncertainties shown by gray shading).*

The state-of-the-art reconstructions of large-scale surface temperature, atmospheric circulation, and continental drought described above will provide the baseline for the analysis and comparison with results from modeling studies, described in this proposal. These comparisons will focus on the past several centuries over which the most detailed regional information will be available, but it is expected that more limited but still useful regionally-resolved information will be available more than a millennium back in time.

2.2. CFR Sampling Strategies

The analysis of both model simulations (e.g. Shindell et al, 2003; Mann and Schmidt, 2003) and empirical reconstructions (Mann et al, 2003; Rutherford et al, 2004) demonstrates the importance of considering spatial and seasonal sampling dials in interpretation both spatial patterns, and large-scale means from CFR results. For example, biased estimates of hemispheric annual mean temperature variations are likely if using networks emphasizing only warm-season and continent-only conditions (Shindell et al, 2003; Mann et al, 2003; 2004; Rutherford et al, 2004; Mann et al, 2004). This is one example of the importance of careful network design and spatial/seasonal sampling strategies in pursuing proxy-based CFR.

One important tool in the design of strategies for improved proxy-based CFR has been the testing of reconstruction strategies based on the analysis of synthetic networks of indicators taken from model simulations (Bradley, 1996; Zorita et al, 2003; Rutherford et al, 2003) or based on resampling of the instrumental record (Evans et al, 1998; Mann and Rutherford, 2002). Mann and Rutherford (2002) analyzed reconstructions using "pseudoproxy" networks obtained by resampling the instrumental surface temperature record with gridpoint subsets of varying distribution and sparseness, seasonal window, and additive noise level (representing the 'signal-to-noise' of proxy), and character ('white', 'red', or 'blue').

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These tests demonstrated the increasing importance of the precise spatial location of indicators as networks become increasingly sparse (e.g., in the neighborhood of 20 or so independent samples). Rutherford et al (2003) took a similar strategy, constructing varyingly sparse networks of 'indicators' instead from the surface temperature field output of control and forced integrations of the Geophysical Fluid Dynamics Laboratory (GFDL) R30 coupled ocean-atmosphere model. This primary aim of this latter study was to test the influence of anthropogenic non-stationarity on the calibration/reconstruction process using 'noise-free' model pseudoproxy networks (i.e., simple sparse subsets of gridpoints from the actual model surface temperature field. This study yielded, among other insights, the conclusion that unbiased proxy reconstructions result even in the presence of anthropogenic influence on the 20th century temperature record used for calibration.

More recent experiments, currently in progress, combine the approaches of Mann and Rutherford (2002) and Rutherford et al (2003), designing pseudoproxy networks from long integrations of the Geophysical Fluid Dynamics Laboratory's (GFDL) coupled General Circulation Model (GCM), and using both forced and long-term control simulations to examine issues related to the longer-term stationarity of CFR results. The derivation of pseudoproxy networks from these model integrations allows for a far more flexible set of experiments. Using a combined 900 yr control run with a natural multi-century cooling trend and a 225 year forced run the long-term performance of the hybrid frequency-domain RegEM CFR approach described by Rutherford et al (2004) is being investigated with respect to the length of the calibration period, and allowing for varying distribution and sparseness, seasonal window, and additive noise level and character. Preliminary results (Figure 5) show... [**SCOTT?? (briefly!)**].

[FIGURE 5-**SCOTT**: GFDL PSEUDOPROXY EXPERIMENT RESULT]

2.3. Model/Data Comparison and Establishing Underlying Dynamical Mechanisms

A large number of simulations of Northern Hemisphere mean temperature spanning the past millennium or longer have been performed over the past few years (see Figure 7) using the full hierarchy of available climate models and estimates of past natural and anthropogenic radiative forcing histories (Bertrand et al., 2002; Gerber et al, 2003; Bauer et al, 2003; Hegerl et al, 2003; Goose et al, 2003; Gonzales-Rouco et al, 2003, Crowley et al, 2003; Andronova et al, 2004; Schmidt et al, 2004; Crowley, 2004). These simulations have yielded a number of important conclusions including (a) The modeled late 20th century hemispheric-mean warmth is anomalous in a long-term context, (b) this anomalous warmth can only be explained by anthropogenic (greenhouse gas plus sulfate aerosol) forcing and (c) the modeled natural variability is consistent with long-term proxy-based reconstructions within published uncertainties. The comparisons of modeled and reconstructed hemispheric temperature histories implies a sensitivity of the climate to radiative forcing consistent with the typical range of estimates of 1.5-4.5^{o}C/2xCO_2 (see Jones and Mann, 2004). Experiments with a coupled climate/carbon cycle model by Gerber et al (2003) suggest a low-to-medium range sensitivity based on additional constraints from the observed CO_2 record.

Several of the simulations over-predict the net warming that has occurred since the early/mid 19th century as evident from the instrumental record (and reconstructions), leading to the appearance of colder

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temperatures in past centuries when aligned with the modern instrumental record (Figure 6). Simulations that take into account 19th and 20th century land use changes (Bauer et al in Figure 6), however, more closely match the observations, suggesting the importance of including land use changes as a significant 19th and 20th century external radiative forcing (Govindasamy et al, 2001). One model simulation that produces especially large-amplitude variations (e.g. "GKSS" in Figure 6) assumes an extremely high amplitude solar forcing (nearly 8W/m^2 change in solar constant over the course of the simulation), leading to substantial solar-forced hemispheric mean temperature changes in the past. By contrast, other studies find little evidence to support such a substantial solar forcing of hemispheric mean temperature changes (e.g. Crowley, Gerber et al, and CSM in Figure 6; see also Hegerl et al, 2003).

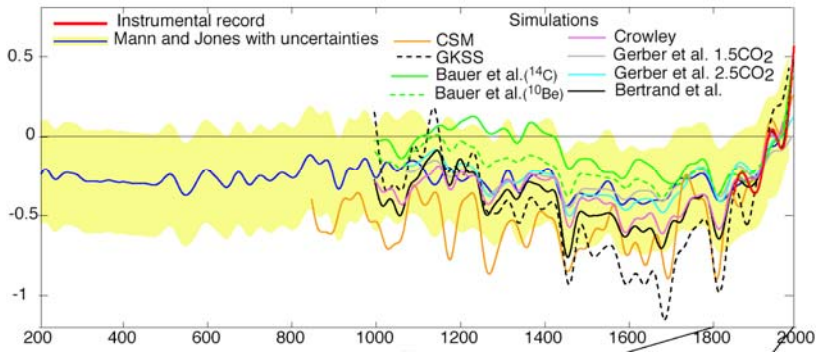

FIGURE 6 *Model-based estimates of northern hemisphere temperature variations over the past two millennia (from Jones and Mann, 2004). Shown are 40 year smoothed series. The simulations are based on varying radiative forcing histories (see Figure 7), employing a hierarchy of models including one-dimensional energy based models (Crowley, 2000), two-dimensional reduced complexity models (Bauer et al., 2003; Bertrand et al., 2002; Gerber et al., 2003), and full three-dimensional atmosphere-ocean general circulation ('GKSS'--Gonzalez-Rouco et al, 2003; 'CSM'--Ammann et al., submitted). Shown for comparison is instrumental northern hemisphere record 1856-2003, and the proxy-based estimate of Mann and Jones (2003) extended through 1995 (see Jones and Mann, 2004) with its 95% confidence interval. Models have been aligned vertically to have the same mean over the common 1856-1980 period as the instrumental series (which is assigned zero mean during the 1961-1990 reference period).*

A significant limitation in these previous coarse-scale studies is that the models used in these studies do not satisfactorily resolve important dynamical processes with the climate that may in fact mediate much of the response to radiative forcing changes, and thus may be of primary importance in interpreting reconstructed patterns of past climate change. These dynamical processes include (a) detailed stratospheric dynamics, photochemistry, and stratosphere/troposphere dynamical coupling (which have an important influence on the behavior of the Annular Modes, e.g. the AO/NAO--e.g. Shindell et al, 1999;2001), and (b) the tropical wave dynamics (i.e., the Bjerknes feedbacks) responsible for ENSO, and potentially the forced response of the climate (e.g. Cane et al, 1997). Other more targeted studies, using models capable of resolving these processes, have been recently used to examine more closely the potential role of such dynamical responses to forcing in interpreting climate changes in past centuries. Indeed, much of the recent progress in interpreting paleoreconstructions of climate in past centuries has come from more regionally focused studies using models capable of addressing such dynamical changes in the climate.

Ongoing collaborative work with the NASA GISS modeling group (Shindell et al, 2001;2003;2004) has identified a prominent role in the planetary wave response to past radiative forcing changes in explaining observed patterns of spatial temperature change in past centuries. While solar forcing leads to only moderate changes in hemispheric mean temperature, the reinforcing seasonal patterns of continental summer cooling (due to decreased summer irradiance combined with the lesser thermal inertia over land) and regional temperature changes associated with a dynamical stratospherically-forced tendency towards the negative phase of the NAO/AO during the Northern winter, leads to a tendency of strong cooling in some regions, such as Europe, but warming in other regions during times of decreased solar irradiance. This prediction matches the spatial pattern of response to solar forcing estimated from proxy-reconstructed surface temperature patterns (Shindell et al, 2001). The response to solar forcing contrasts

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with the response to explosive tropical volcanic forcing which is associated with a tendency for continental summer warming, but an offsetting tendency for dynamically-induced winter warming in substantial regions of the continents. This latter response results from the differential heating/cooling of lower stratosphere/upper troposphere associated with volcanic aerosol forcing, which leads, through thermal wind considerations, to a tendency for the positive phase of the NAO/AO (see also Robock , 2000). While volcanic forcing exhibits a greater hemispheric-mean temperature influence, due to the substantially greater associated radiative forcing changes, the tendency for seasonally-opposite direct radiative and dynamical responses leads to a muted pattern of spatial variation. The combination of the responses to the two natural forcings matches well observed proxy-reconstructed patterns of temperature change in past centuries (Figure 7).

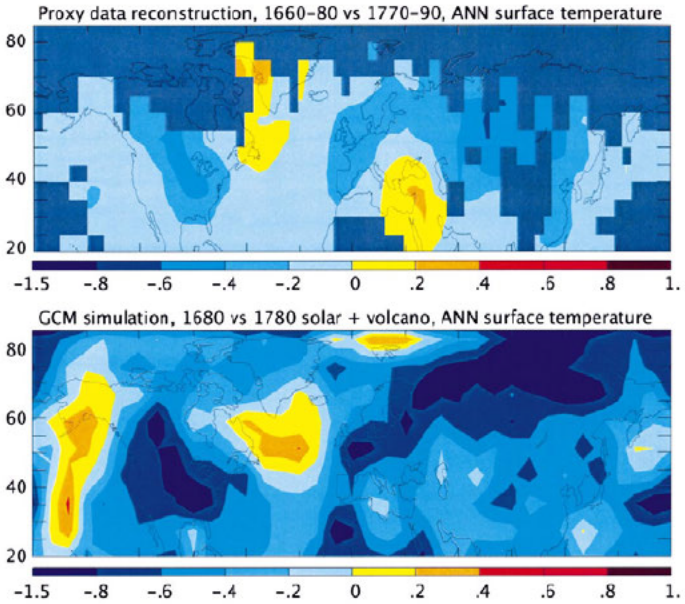

FIGURE 7 *(top) Reconstructed and (bottom) simulated annual average temperature difference between 1660–80 and 1770–90. The reconstructed surface temperatures are based on a multiproxy estimate using tree rings, ice cores, corals, and historical data (Mann et al. 1998). Model results are based on the sum of the response in two simulations: one incorporating reconstructed solar irradiance changes during this period and one using volcanic forcing scaled to changes over this time.*

The model-predicted spatial pattern of radiatively induced continental summer cooling combined with dynamically induced winter warming in substantial regions of the continents is in good agreement between the simulations and post-volcanic event composites determined from seasonally-resolved proxy-reconstructed temperature patterns (Shindell et al, 2004; see also Figure 1). The seasonally-opposing trends over continental regions associated with volcanic forcing appears to explain (see Mann, 2002b; Shindell et al, 2004; Rutherford et al, 2004) the greater amplitude variations in surface temperature reconstructions that emphasize continental regions and summer season conditions (e.g. Esper et al, 2002; Huang et al, 2000). Analyses underway for the past two millennia described in section 2.1 should soon complement current isolated longer-term evidence (Keigwin and Pickart, 1999; Noren et al, 2002; Rimbu et al, 2003) for a prominent role of the AO/NAO on region climate variability over the past several millennia.

Other recent modeling work has focused on the response of the tropical Pacific to natural radiative forcing changes over the past 1000 years. Mann et al (2004) investigated the response of El Niño to natural radiative forcing changes over the past 1000 years based on numerical experiments employing the Zebiak-Cane (Zebiak and Cane, 1987) model of the tropical Pacific coupled ocean-atmosphere system. Previously published empirical results (Adams et al, 2003) demonstrating a statistically significant tendency towards El Niño conditions in response to past volcanic radiative forcing are reproduced in the model experiments. A combination of responses to past changes in volcanic and solar radiative forcing closely reproduces changes in the mean state and interannual variability in El Niño in past centuries recorded from fossil corals (Cobb et al, 2003). These experiments suggest that the dynamics of El Niño may have played an important role in the response of the global climate to past changes in radiative forcing in past centuries. The ENSO-scale response isolated in this study implies both a decrease in the

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amplitude of the global or hemispheric-mean warming (cooling) associated with increased (decreased) radiative forcing in past centuries, and a decrease (increase) in the poleward temperature gradient between equator and midlatitudes in response to increased (decreased) radiative forcing. Such a response would argue for somewhat lower amplitude variability in actual hemispheric or global mean temperature in past centuries than is predicted by models which either do no resolve at all, or resolve incompletely, the physics underlying ENSO (e.g. Rind et al, 1999; Crowley, 2000; Gonzalez-Rouco et al, 2003). This response would furthermore help to explain apparent evidence that extratropical temperature changes in past centuries (e.g. Esper et al, 2002) have been greater in amplitude than tropical (Hendy et al, 2002) or full hemispheric-scale (e.g. Mann et al, 2003) temperature changes.

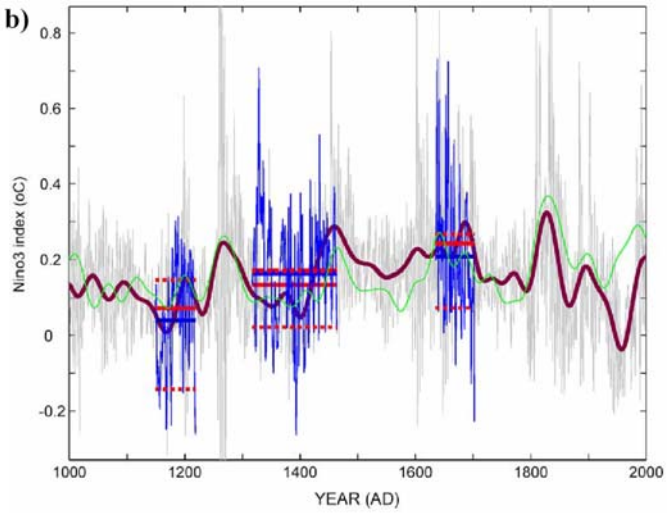

FIGURE 8 *Comparison (from Mann et al, 2004) of the ensemble annual mean Niño3 response to combined natural radiative forcing (volcanic+solar) over the interval AD 1000-1999 (gray--anomaly in ^{o}C relative to AD1950-1980 reference period; 40 year smoothed values shown by thick maroon curve) with reconstructions of ENSO behavior from Palmyra coral oxygen isotopes (blue--the annual means of the published monthly isotope data are shown). The coral data are scaled as described in the ttext, with warm-event (cold-event) conditions associated with negative (positive) isotopic departures. Thick dashed lines indicate averages of the scaled coral data for the three available time segments (blue) and the ensemble-mean averages from the model (red) for the corresponding time intervals. The associated inter-fourth quartile range for the model means (the interval within which the mean lies for 50% of the model realizations) is also shown. The ensemble mean is not at the center of this range, due to the skewed nature of the underlying distribution of the model Niño3 series. Also shown (green curve) is the 40 year smoothed model result based on the response to volcanic forcing only, with the mean shifted to match that of the coral segments.*

The conclusions from Mann et al (2004) of an El Niño-like state during the otherwise generally cold 17th century (e.g. Crowley, 2000; Mann et al, 2003) and a La Niña-like state during the otherwise relatively mild 12th/13th centuries (Crowley, 2000; Mann et al, 2003) appears to be consistent with changes observed in ENSO-sensitive drought regions. Verschuren et al (2000) provide lake-level evidence in equatorial east Africa (Kenya) for peak wet conditions during the mid-17th to the mid-18th centuries, and dry conditions during the early (11th-13th) centuries of the millennium, reminiscent of anomalies typically associated with El Niño and La Niña conditions, respectively. A similar pattern of drought in earlier centuries and wet conditions in later centuries in the desert southwest of North America (Woodhouse and Overpeck, 1998) favors this interpretation as well.

3. Proposed Research

3.1 Empirical proxy-based climate reconstruction

The proposed work attempt to extend reconstructions further back in time, over the past several millennia, based on the analysis of available proxy archives for course resolution proxy indicators possessing reliable information about temperature variations on multi-millennial timescales. [**RAY**, THIS IS REALLY YOUR STUFF-PLEASE FEEL FREE TO EXPAND BRIEFLY]. ALSO, **MALCOLM**: ANY THOUGHTS ABOUT POSSIBLE USE OF SELECT TREE-RING RECORDS ON THESE TIMESCALES]. Hemispheric or global mean temperature composites estimates will be determined based on compositing approaches used in earlier studies using multiproxy temperature indicators to reconstruct hemispheric and global mean temperatures (Bradley and Jones, 1993; Jones et al, 1998; Crowley and

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Lowery, 2000; Mann and Jones, 2003). The possibility of using CFR approaches (Mann et al, 1998; Evans et al, 2002; Luterbacher et al, 1999;2000;2004; Rutherford et al, 2003; 2004) applied to these more coarsely resolved indicators (potentially including, in this case, non-temperature proxy records) will also be investigated. The strategy, here, would be to use available higher-resolution surface temperature field reconstructions over the past two millennia (rather than the instrumental surface temperature record) as a template for calibration of the longer-term (multi-millennial) temperature proxy data. These analyses will be guided by the use of models and analyses of the instrumental record to determine optimal sampling strategies (Bradley, 1996; Evans et al, 1998; Mann and Rutherford, 2002; Zorita et al, 2003; Rutherford et al, 2003), building on current work in this area described in section 2.2. The optimal sampling experiments will make use of available climate field output from the GFDL R30 simulations used previously (section 2.2), and more realistic natural and anthropogenic forced millennial simulations (see section 3.2) of the coupled NCAR CCSM1 model and ECBILT model (in collaboration with H. Goosse of the University of Louvain, Belgium [**HUGUES**: ANY COMMENTS HERE?]). These experiments will be particularly important in guiding the proposed extensions, as we expect that only on the order of 10-30 (guess! **Ray?**) proxy records with reliable regional temperature information on these timescales. With such sparse networks, the reliability of the resulting reconstruction is likely to be more sensitive to the precise location of available proxy information (see Mann and Rutherford, 2002). [**SCOTT AND GENE**: CARE TO ELABORATE ON ANY OF THIS (BRIEFLY)].

3.2 Modeling of past climate changes

Several different models and modeling experiments will be used to analyze to investigate processes and forcings that may be responsible for past observed climate changes.

a. Specified SST forcing of atmosphere

Here we will use proxy estimates of Sea Surface Temperature diagnosed to drive atmospheric GCMs to assess possible SST forcing of large-scale atmospheric circulation changes in past centuries. In one set of experiments (collaborative with Schmidt and Shindell at NASA/GISS [**GAVIN/DREW**: ANYTHING TO ADD HERE?]) we will use the GISS ModelE atmosphere forced with proxy-reconstructed Sea Surface Temperatures patterns (as described in section 2.1) available with greatest spatial detail back to AD 1600 to diagnose the large-scale atmospheric response to estimated past SST forcing. In another set of experiments (collaborative with Ammann at NCAR), we will drive the NCAR CSM1 atmosphere with a reconstruction over the past millennium of tropical Pacific SSTs only (using the coral-based Nino3 estimate described in Mann et al, 2004) to diagnose the large-scale atmospheric response to ENSO variability in past centuries. Of particular interest here is the potential relationship between tropical SST forcing and patterns of continental drought in North America and Africa in past centuries. This work is synergistic with and complimentary too a separate collaboration between Mann and colleagues at Lamont Doherty/Columbia (M. Cane, S. Zebiak) and U. Miami (A. Clement) to diagnose the response of ENSO to past radiative forcing, a current collaboration between Mann, Ammann and N. Graham of Scripps Inst. Of Oceanography aimed at diagnosing the relationship between ENSO and western drought in past centuries from proxy records and climate model simulations [**CASPAR:** ANYTHING YOU'D LIKE TO ADD HERE?], and a currently funded project involving coral-based reconstructions of IndoPacific climate changes in past centuries involving Mann and collaborators J. Cole (Univ. Arizona) and V. Mehta (CRCES, Maryland).

b) *External radiative forcing of the atmosphere*

Here we will focus on experiments using the GISS atmospheric model with interactive stratospheric photochemistry and mixed-layer ocean (GISS), similar to that used in previous studies (Shindell et al, 2001;2003;2004). In particular, using the expanded seasonal reconstructions of both temperature and SLP described in section 2.1, we hope to address (see section 3.3) the role of the NAM response to solar and volcanic radiative forcing. These analyses will expand on the analyses of Shindell et al (2001;2003;2004) by focusing on a longer timeframe (past millennium or further, rather than just the past few centuries) and

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looking at both SLP and temperature fields as diagnostics of the atmospheric dynamical response to forcing [**DREW/GAVIN**: ANYTHING TO ADD HERE?]. Building on these past studies, the behavior of the Southern Annual Mode (SAM) or "Antarctic Oscillation" over the past millennium will also be analyzed. These latter analyses will be synergistic with a currently funded NSF project involving Mann and collaborators E. Steig and D. Weinbrenner at the University of Washington aimed at reconstructing past Antarctic climate patterns (including the SAM) from high-resolution ice core data.

c) External radiative forcing of coupled ocean-atmosphere model

Here, we will make use of simulations using coupled ocean-atmosphere models (NCAR CCSM1 coupled model in collaboration w/ C. Amman of NCAR and we will collaborate with H. Goosse of Louvain in similar experiments using the ECBILT model. The model experiments will be forced by detailed estimates of past radiative natural and anthropogenic radiative forcing histories to address the response of the large-scale climate system to past radiative forcing **[CASPAR, HUGUES COMMENTS?]**. These modeling experiments will also be used in tests of proxy network sampling strategies as described in section 3.1 above.

The NCAR simulations make use [**CASPAR?**] of the coupled CCSM1 ocean-atmosphere model which includes faithful representation of the ocean and atmospheric processes underlying tropical Pacific coupled ocean-atmosphere dynamics and can thus provide insights into the potential response of such dynamics to past radiative forcing changes, building on preliminary studies based on a low-order modeling approach (Mann et al, 2004). Particular focus will be payed to ENSO-scale responses (and implications for continental drought patterns in past centuries). These simulations will be complimentary to those obtained by the specified SST experiments described in section "a" above. While the specified SST approach seeks to investigate relationships based on what is interpreted to be the particular unique realization of the tropical Pacific climate and extratropical responses exhibited by the actual climate, the coupled modeling approach will yield an ensemble of possible realizations in response to estimated radiative forcing histories. The resulting ensemble may or may not envelope the actual observed climate trajectory depending on the extent to which the response of the model to past radiative forcing actually captures the processes relevant to the observed history. The role of other large-scale dynamical responses involving the Annual Modes and changes in meridional overturning ocean circulation, will also be investigated in these simulations.

The NCAR model will be forced by estimated natural (volcanic and solar) radiative forcing changes over the past one to two millennia. A range of solar and volcanic forcing estimates have been used in past studies (e.g. Crowley et al. 2003; Bertrand et al, 2003; Ammann et al, 2003--see Figure 7 of Jones and Mann, 2004 for a comparison of different estimates) The radiative forcing estimates of Ammann et al (2003) will be used, as they offer both seasonal and latitudinal resolution, and certain dynamical responses to radiative forcing appear to depend on such details (Shindell et al, 2003;2004; Mann et al, 2004). Given recent evidence (Lean et al, 2002) that estimates of long-term solar radiative forcing used in most other recent studies (Crowley, 2000; Shindell et al, 2001; 2003; Bertrand et al., 2002; Gerber et al, 2003; Bauer et al, 2003; Hegerl et al, 2003; Goose et al, 2003; Gonzales-Rouco et al, 2003, Crowley et al, 2003; Andronova et al, 2004; Schmidt et al, 2004; Crowley, 2004) are potentially overestimated, we intend to use both the previous estimates of Ammann et al (2003), and a newer, more conservative estimate of past solar irradiance change (Ammann, pers. comm.) based only on the 11 year solar cycle, as motivated by Lean et al (2002). This will allow us to examine the sensitivity of estimates to the assumed long-term solar forcing (see also Mann et al, 2004). In addition to the anthropogenic (greenhouse gas and sulphate aerosol) forcings, we will (**CASPAR**: REASONABLE TO PROPOSE?) include estimates of radiative forcing due to 19th and 20th century land use changes (Ramankutty and Foley, 1999; see also Bauer et al, 2003).

In addition, experiments will be performed to address possible pre-industrial non-natural (human) influence on atmospheric CO_2 levels (**CASPAR, BILL**: COMMENTS?). While one past study has interpreted pre-industrial CO_2 changes over the past 1000 years as entirely due to changes in terrestrial

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carbon uptake resulting from surface temperature changes themselves (Gerber et al, 2002), this conclusion depends on an averaging of different ice core CO_2 histories with potentially inconsistent age models. If one uses instead the single (Law Dome) record with highest (multidecadal) temporal resolution (*Etheridge et al*., 1996), the pre-industrial estimates show greater than 10ppm peak-to-peak variations, which are in fact radiatively significant, and could plausibly have arisen from human influences: pandemics/disease and other population fluctuations in various regions of the world during various periods over the past 2000 years. We propose to address this issue by prescribing the CO_2 changes as a "forcing" over the past 1000-2000 years, potentially decreasing the estimate by various fractions (e.g. 0.75, 0.5) to allow for varying levels to which the CO2 variations may represent a 'response' (e.g. Gerber et al, 2003) rather than 'forcing'. The CO_2 series to be used as a forcing will be based on a composite of Law and Taylor dome cores, using age model adjustments and linear interpolations between available dates as appropriate.

A separate set of experiments are being performed by collaborator H. Goose [**HUGUES**: COMMENTS HERE? DO I HAVE THIS RIGHT?] using several different versions of the ECBILT model driven by natural (volcanic, solar from Ammann et al, 2003) and anthropogenic (greenhouse gas and aerosol) forcing over the past 1000 years. Experiments are being performed using ECBILT-CLIO, a fully coupled 3-D atmosphere-ocean-sea-ice model, and ECBILT-CLIO3-VECODE which additional includes an interactive dynamic vegetation model (DVM) 'Vecode'. In the ECBILT-CLIO3-VECODE, experiments, greenhouse gases are prescribed over the whole period and forcing by natural volcanc, solar, and land-use change is provided. In other experiments with ECBILT-CLIO2, pre-industrial greenhouse gas concentrations and land surface properties are constant. While the ECBILT model does not resolve ENSO-scale dynamics, it has been used with considerable success to analyze possible feedbacks and delays in the large-scale climate response to radiative forcing changes associated with the behavior of the meridional overturning ocean circulation. Such responses appear to include a delay of temperature changes in Southern Hemisphere temperatures in response to radiative forcing changes (Goosse et al, 2004). These simulation results should thus provide insight into existing empirical evidence of multidecadal/century-scale variability associated with changes in the meridional overturning circulation and "Atlantic Multidecadal Oscillation" (e.g. Delworth and Mann, 2000; D'Arrigo et al, 2003a; Gray et al, 2003;2004) and connections with radiative forcing (Cubasch et al, 1997; Bond et al, 2001; Waple et al, 2002). Possible influence on drought (Gray et al, 2003). Influence on drought, conbined with pacific influence on drought Gray et al, 2003).

3.3 Model/Data Comparison

Conclusions regarding the forcings and processes underlying reconstructed past climate histories will draw upon standard statistical univariate and multivariate approaches to the problem of model/data comparisons:

a) Composite Analyses:

To establish whether a model-predicted response to an episodic (e.g. volcanic) forcing exists in an empirical climate reconstruction, we will apply 'superposed epoch analyses' (e.g. Adams et al, 2003; Mann et al '04) in the case of time series (e.g. Nino3 vs. volcanic events) or conventional composite analyses (e.g. as in Shindell et al, 2004 with respect to the evaluation of post-volcanic seasonal large-scale surface temperature response) in the case of spatial fields.

b) Model/Data Misfit Analyses

We will use simple objective metrics, such as mean-square error ('MSE') (or potential alternative penalty functions) to characterize the degree of misfit between an observed and model-predicted time series. When a set of alternative forcing scenarios are used in a set of simulations (see section 3.2 "c"), such an objective metric can be used to determine the set of forcings (and their amplitudes) most consistent with a

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reconstructed target index such as the Northern Hemisphere mean temperature, or Nino3 index of the tropical Pacific climate. Applying such metrics, we will seek to identify the forcing histories most consistent with empirical, reconstructed past climate changes. Such an approach will, for example, be taken to assessing the relative apportioning of forcing vs. response that is most consistent with past hemispheric temperature changes and CO_2 histories as discussed in section 3.2 (In addition, other strictly empirical comparison, such as a convolution filter accommodating timescale dependent lags, applied to CO_2 and temperature records, might be attempted).

For comparisons of fields, rather than time series, we will also use standard available methods. Correlation fields will be used to provide a empirical estimate of the spatial pattern of response to a forcing (e.g. the spatial pattern of correlation of surface temperature reconstructions against reconstructed solar forcing indices--e.g. Waple et al, 2002). When both a model and empirical pattern of response are available (e.g. Shindell et al, 2001;2003) both conventional spatial correlation and multivariate penalty functions (e.g. spatially-integrated MSE) will be used to assess the level of agreement between model-predicted and empirically-estimated response. Such comparisons might be restricted to particular frequency-bands of interest (e.g. Waple et al, 2002). An example of such an application in this project would be the statistical comparison of spatial patterns of multidecadal timescale (e.g. 40-100 year band-passed) reconstructed drought or Sea Level Pressure against the corresponding model-predicted fields, identically filtered, produced in a specified SST forcing simulation (see section 3.2 "a"), over a particular common interval (e.g. AD 1600-1900).

c) Frequency-Domain analyses: We will use the MTM-SVD approach (see Mann and Park, 1999 for an extensive review) which has previously been applied to networks of proxy data (e.g. Mann et al, 1995) or proxy-reconstructed surface temperature fields (Delworth and Mann, 2000; Mann et al, 2000a) to identify coupled patterns of variability with preferred timescales that are evident simultaneously in reconstructed fields of surface temperature, sea level pressure, and continental drought (see e.g. Zhang and Mann, 2004 for such an application). Of particular interest will be the identification of coherent patterns of climate response on timescales associated with specific radiative forcings (e.g. solar--i.e., 11 year, 22 year and 70-80 year timescales--see Waple et al, 2002).

4. Work Plan/Division of Labor

Year 1:

- ?
- ?
-

Year 2:

- ?
- ?
-

Year 3:

- ?
- ?
-

Year 4:

- ?
- ?
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Division of Labor:

P.I. Mann will coordinate the 3 main components of the project with the assistance of a project-supported postdoctoral research associate. The specific breakdown of responsibilities is as follows:

1. Empirical proxy-based climate reconstruction

P.I.s: Mann (???); Bradley (Univ. Mass); Hughes (Univ. Arizona), Rutherford (Roger Williams Univ);; Wahl (Alfred Univ)

Collaborator/s: Goosse (Louvain, Belgium)

2. Modeling of past climate changes:

P.I.s: Mann (consulting role)

Collaborator/s: Schmidt, Shindell and Columbia Univ. graduate student (NASA/GISS and Columbia); Ammann (NCAR); Goosse (Louvain); Ruddiman (Univ. of Virginia)

3. Model/Data comparison:

P.I.s: Mann and ??? post-doctoral research associate

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Budget Justification

Personnel:

Michael E. Mann (XXX Professor, XX University XX) will be the coordinator for this project, playing a prominent role in each of the 3 core components of the project (participating in empirical reconstructions and investigation of sampling strategies, the design of modeling experiments, and model/data comparison activities). We request 2 months summer salary for each of the 4 years for Dr. Mann.

We request support for a postdoctoral research associate who will devote 12 months/year for each year of this project, assisting P.I. Mann w/ the coordination of the various project activities including a focus on data/model comparisons analyses. We also request 4 months/year towards the salary of a technical assistant to U.Va. who will devote the majority of his/her time to this project. Mann will provide the remaining 8 months support from internal funds at XX University.

We also request full-time funding for one graduate student at XX University who will assist in the analysis of model results and comparison of model-produced and proxy-reconstructed patterns. experiments

Fringe benefit rates for XX University, are XX% on summer effort by faculty with nine-month appointments (Mann) and by graduate research assistants, and YY% on salary for Research Associates.

Travel:

A modest travel budget is requested to attend an annual meeting of PI and collaborators in either XX or the host institutions of the various consultants (NASA/GISS New York, NCAR, Boulder CO, Amherst MA) who will be advising on testing of methodologies, comparison with coupled model simulation results, and comparison of reconstructions and model results.

We request funds for travel to the Fall American Geophysical Union Meeting for the purpose of reporting on the progress of the project, and interacting with other members of the paleoclimate and climate modeling communities.

Publications:

We request funds to cover color page charges/reprint costs for 4 to 5 journal articles.

Equipment:

We request funds for a PC and basic required hardware (disk drives) for the servers for data storage, as well as software licenses (e.g., MATLAB), for use in project-related activities.

Materials and Supplies:

Funds are requested to support the purchase of technical software (e.g., MATLAB) and software licenses for use in project-related activities.

Tuition:

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The XX University XX requires that graduate research assistants be supported for the in-state portion of their tuition. Tuition rates in this proposal are based on the current rates for the 2001-2002 academic year ($5,188) and inflated 4% each year, as follows: Year 1 -- $5396; Year 2 -- $5,611; and Year 3 -- $5836.

Indirect Costs:

The indirect cost (F&A) rate approved by DHHS for use by the XX University XX is 48%. That rate is applied to Modified Total Indirect Costs, which in this proposal are Total Direct Costs minus equipment and tuition.

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We intend to engage in collaborations with climate modelers to compare patterns of observed climate variation of the past few centuries to one to two millennia with those generated in model simulations as a consequence of both internal and forced variability, to allow for a more fundamental understanding of this observed climate variability. We intend to concentrate on three particular issues:

1. Dynamical insight from multiple climate fields: We will use the state-of-the art global annual and seasonal reconstructions of surface temperature and sea level pressure variations over the past one to two millennia as a baseline for diagnosing inter-relationships between patterns of past variability in different climate fields. We plan, in collaboration with European colleagues, to compare our SLP reconstructions with those they have produced for the European and North Atlantic sectors based on early pressure records back to 1780 (Jones et all, 1999), or other documentary evidence for the North Atlantic Oscillation and the EU index back to 1675 (Luterbacher et al., 1999) and SLP over Europe for periods as early as 1675 (Luterbacher et al., 2000). These records provide a valuable opportunity to verify our SLP and circulation indices. We will compare the reconstructed climate fields (surface air temperature and SLP) with existing continental drought reconstructions (in collaboration with Cook of Lamont/Columbia and Woodhouse of NOAA/CIRES for insights into the oceanic and atmospheric dynamics underlying climate variability over the past few one-to-two millennia. Various indices of SST (e.g., the "PDO" and Nino3) and atmospheric (e.g., the NAO/AO) variability will be used for inferences regarding mechanism of climate variability and to strengthen long-term detection/attribution exercises (e.g. as in Braganza et al, 2001; Covey et a, 2001; Crowley, 2000).

2. *AO/NAO forcing and North Atlantic Patterns of Climate Variability*: This makes us of collaborations with individuals at NASA/GISS (G. Schmidt and D. Shindell) in seeking to understand forced patterns of winter-season climate variability in the Northern Hemisphere. This work proposes to build on fruitful initial collaborations examining the role of the response of the atmospheric circulation to solar irradiance changes in explaining observed spatial patterns of temperature change estimated in past centuries possibly associated with forcing modulated through the tropics (Shindell et al., 2001; Figure 8). Proposed extensions of this work involve an examination of the additional role of oceanic dynamical responses to atmospheric forcing in explaining patterns of surface temperature variation estimated for the Northern Hemisphere over the past 1000 years. Evidence both from high deposition-rate sediment cores, which resolve climate changes at relatively low resolution (century-scale) *in situ* in the North Atlantic ocean, and hemispheric-scale climate reconstructions from a variety of high-resolution proxy sources, will be employed. The proposed comparisons will also make use of new *seasonal* hemispheric surface temperature and sea level pressure reconstructions employing both high and low-resolution indicators expected to be available over the next several months. The proposed analyses will help to elucidate the role of natural radiative forcing changes in governing patterns of climate (e.g., surface temperature and atmospheric circulation) variation in past centuries and tropical/extratropical interactions, with implications for an improved understanding of past climate epochs such as the "Little Ice Age" and so-called "Medieval Warm Period".

3. *Role of forcing in past tropical SST changes:* These analyses are synergistic with an independent proposed project (Mehta, Cole, Mann) to reconstruct patterns of surface temperature and SLP in the Indo-Pacific region. Improved reconstructions of ENSO will be used to test the viability of theoretical mechanisms of the response of tropical Pacific ocean-atmosphere dynamics to radiative forcing (Cane et al, 1997). Preliminary analyses indicate the viability of an ENSO-like response to volcanic (negative radiative) forcing in past centuries (Figure 9), a possibility originally proposed based on limited modern instrumental data (Handler, 1984), but recently extended over the past few centuries using paleoclimate data (C. Ammann, Ph.D. thesis; University of Massachusetts, unpublished; B. Adams et al, M.S. Thesis, University of Virginia, unpublished). The results of these empirical comparisons will be compared directly against results of experiments (in collaboration with M. Cane of Lamont/Columbia) employing volcanic forcing reconstructions (e.g., Crowley, 2000) to drive multi-century simulations of the Cane-Zebiak (Zebiak and Cane, 1987) model of the tropical Pacific ocean-atmosphere system, which predicts a

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positive (i.e., El Nino-like) response to negative tropical radiative forcing. These experiments will be extended to estimate the response of the tropical Pacific ocean-atmosphere system to combined solar and volcanic radiative forcing over the past few centuries. Such experiments will be used to test, for example, the viability of external radiative forcing in explaining the apparent tendency for El Nino conditions during the late 17th/early 18th century discussed earlier. We believe that such experiments are essential to estimate the potential for tropical ocean-atmosphere dynamical responses in modifying the hemispheric/global pattern of climate response to external forcing in past centuries, and as such, these experiments will be complementary to similar recent experiments with global energy-balance models (Crowley, 2000).