Eric's thoughts on the Holocene

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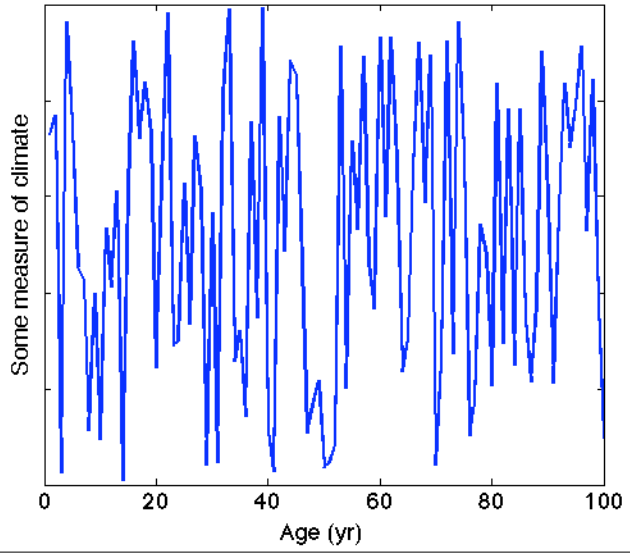
"Variability"

The only sensible definition of "millennial-scale" variability is *the magnitude of variability millennially-averaged climate data".*

This is important because *all* climate or climate proxy data will display some variabilty from millennium-to-millennium. The question is whether it is important.

Example:

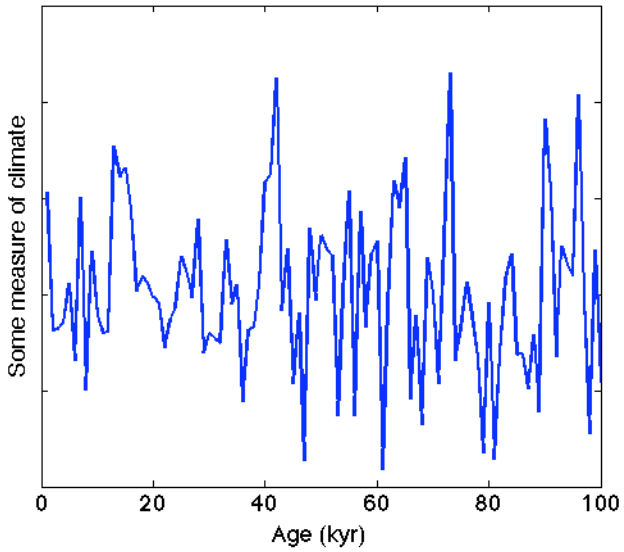
Random "climate proxy" data, annually averaged.



Example:

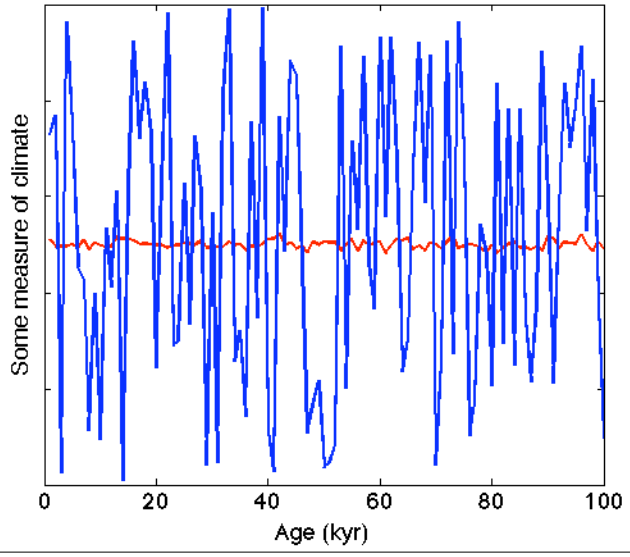
The same "climate proxy" data, millennially-averaged.

Note the "significant millennial-scale variability"!



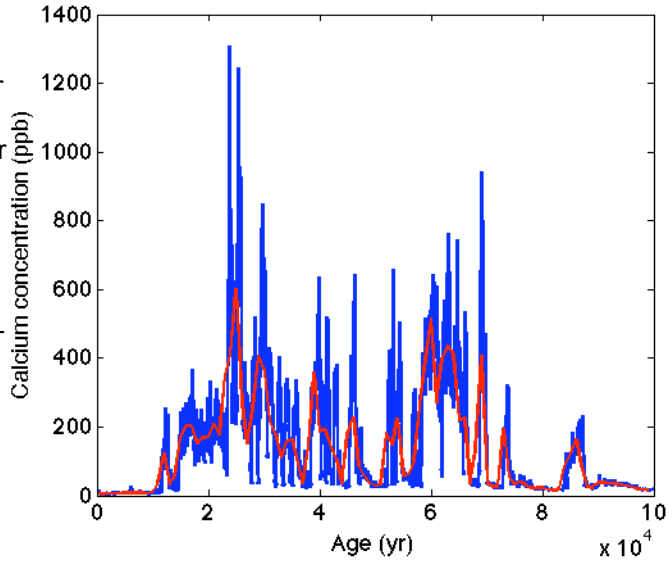
Example:

- Annually averaged and millennially averaged data on the same vertical scale.
- Oops, the "millennial-scale variability" is not so important after all, is it?



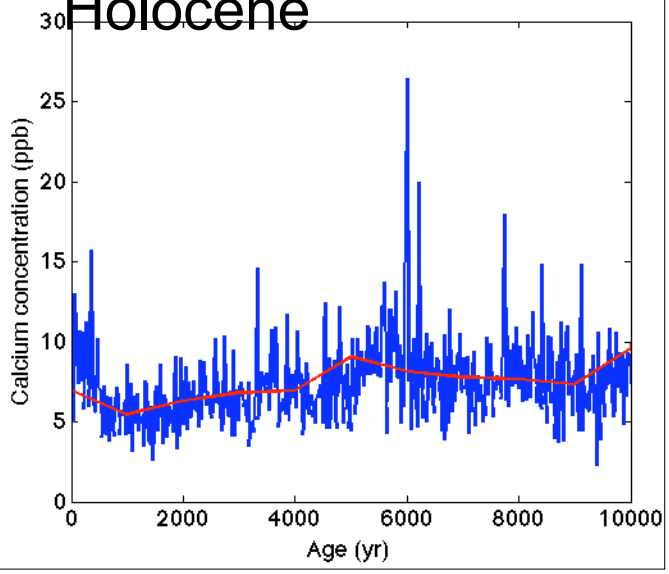
GISP2 Calcium

- Calcium is a proxy for "dustiness"
- Red shows 1000-year averages, blue = 20-yr averages.
- Note that the "millennial-scale" variabilty is nearly as great as the 20-year variability.
- Yes, the data really are at <20yr resolution throughout.



GISP2 Calcium -- the Holocene

On the other hand, during the Holocene, the 20-year variabilty is far greater than the 1000-year variability.



GISP2

- Evidently, the Holocene at GISP2 is fundamentally different than the glacial period.
- Most people would attribute this to the huge "disruptions" in climate caused by things like "Heinrich events", which case a great deal of difference from one millennium to the next (but which don't occur during the Holocene)
- But how much does the rest of the world (outside Greenland) care about whether it is "glacial" or "Holocene" conditions?

GISP2

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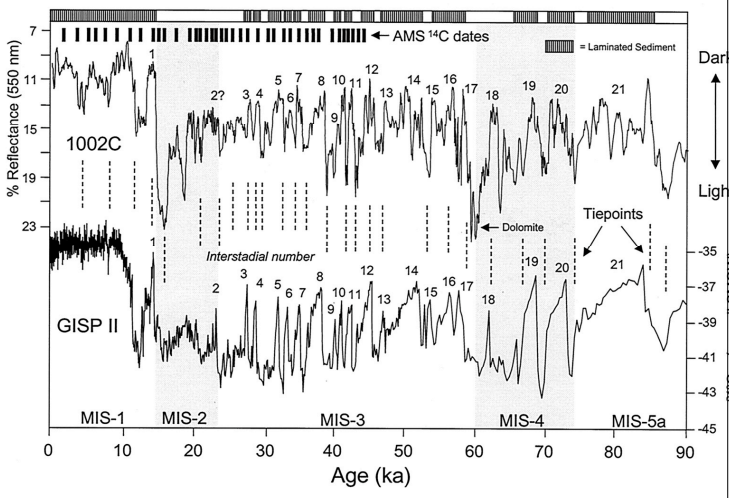
- But how much does the rest of the world (outside Greenland) care about whether it is "glacial" or "Holocene" conditions?

Cariaco Basin

What accounts For the Holocene variability at Cariaco basin?

Doesn't the variability appear just as large on millennial timescales as it is during the glacial?

Many many other records look just like this.



Questions I'd like to address in this seminar

- What is the magnitude of millennial-scale variability in the Holocene in different regions?
- Can we account for it either with straightforward dynamics or with well-established forcing (e.g. plausible volcanic or solar variations, as is claimed by many for the Little Ice Age)?
- If not, then what magnitude of forcing do we need, or what plausible but unobserved dynamics can we invoke?