

Paleoclimate constraints on ENSO statistics

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Our ability to judge the significance of recent changes in ENSO is fundamentally limited by the shortness and sparsity of the instrumental record. It is therefore crucial to extend the latter, with an estimate of associated uncertainties. In this talk I use proxy-based reconstructions of tropical Pacific SST to explore 3 main questions:

1. have ENSO flavors changed over the past 400 years? How can we tell?
2. what is the relationship between ENSO and natural (i.e. solar, volcanic, orbital) forcing over subsets of the Holocene?
3. how can proxy records constrain changes in ENSO variability and skewness over time? with what uncertainties?

The first question will be tackled with a coral-only reconstruction of tropical Pacific SST using the graphical EM (GraphEM, *Guillot et al.*, submitted) algorithm. It reveals the occurrence of central Pacific events during the Little Ice Age followed by a long lag until the late twentieth century. However, with current paleo-observations, such changes appear to be driven by changes in proxy availability.

The second question is tackled using: (1) the aforementioned coral-based SST reconstruction, (2) a multiproxy reconstruction of NINO3.4 covering the past 850 years (*Emile-Geay et al.*, 2013a,b), (3) recent evidence from coral snapshots covering part of the past 7,000 years (*Cobb et al.*, 2013).

The third question is tackled via a statistical analysis of skewed proxy archives (*Emile-Geay and Tingley*, in prep) and considerations of the “Gaussianization” of SST excursions by oxygen isotopes. We conclude with a synthesis of which changes can and cannot be constrained by existing and future proxy observations.

References

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