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# Reconstructing ENSO – Methods, Proxy Data and Teleconnections

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The El Niño/Southern Oscillation (ENSO) is globally important and influences climate at interannual and decadal time-scales with resultant links with extreme weather events and associated socio-economic problems. An understanding of the ENSO system is therefore crucial to allow for a better understanding of how ENSO will 'react' under current global warming. Palaeoclimate reconstructions of ENSO variability allow extension prior to the relatively short instrumental record. However, due to the paucity of relevant annually resolved proxy archives (e.g. corals) in the central and eastern Pacific, reconstructions must rely on proxy data that are located in regions where the local climate is teleconnected with the tropical Pacific. In this study we compare three newly developed independent NINO3.4 SST reconstructions using data from (1) the central Pacific (corals), (2) the TexMex region of the United States (tree-rings), and (3) other regions in the tropics (corals and an ice-core) which are teleconnected with central Pacific SSTs in the 20th century. Although these three reconstructions are strongly calibrated and well verified, inter-proxy comparison shows a significant weakening in inter-proxy coherence in the 19th century. This break down in common signal could be related to insufficient data, dating errors in some of the proxy records or a break down in ENSO's influence on other regions. However, spectral analysis indicates that each reconstruction portrays ENSO-like spectral properties. Superposed epoch analysis also shows that each reconstruction shows a generally consistent 'El-Niño-like' response to major volcanic events in the following year, while during years T+4 to T+7, 'La Niña-like' conditions prevail. These results suggest that each of the series expresses ENSO-like 'behaviour' but this 'behaviour' however does not appear to be spatially or temporally consistent. This result may reflect published observations that there appear to be distinct 'types' of ENSO variability depending on location within the tropical Pacific. Future work must address potential dating issues within some proxies (i.e. sampling of multiple coral heads for one location) as well as assessing the time-stability of local climate relationships with central Pacific SSTs. More emphasis is needed upon sampling new and extending old coral proxy records from the crucial central and eastern tropical Pacific region.