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Towards evaluating natural forced and unforced variability in ENSO: strategies for model / paleo-proxy data inter-comparison

Tom Russon (1), Alexander Tudhope (1), Gabriele Hegerl (1), Mat Collins (2,3), and David Battisti (4)

(1) School of GeoSciences, University of Edinburgh, UK (tom.russon@ed.ac.uk), (2) College of Engineering Mathematics and Physical Sciences, University of Exeter, UK, (3) Met Office Hadley Centre, Exeter, UK, (4) Department of Atmospheric Sciences, University of Washington, USA

Unforced control run experiments with several GCMs have suggested that significant decadal to centennial variability may exist in the ENSO phenomenon. If true, this would have severe implications for the predictability of ENSO on these same time-scales in response to forced changes in global climate. However, the relatively short duration of observational records of ENSO variability means that it is impossible to rigorously evaluate the model output using observational data constraints. Paleo-proxy reconstructions of tropical Pacific climate variability over the mid/late Holocene offer an alternative source of data with which to do this and even more fundamentally, with which to constrain the range of 'natural' (forced and unforced) ENSO variability. Comparison of these data-sets with the climate as seen in the GCMs is, however, rendered difficult by the sparse spatial coverage and multiple environmental controls inherent to the proxy data. One strategy to overcome these difficulties is to constrain the spatial patterns and teleconnections of ENSO variability, as seen in unforced and natural (solar/volcanic) forced runs of GCMs, in a way that is as relevant as possible to the proxy variables themselves. In particular, the use of isotope enabled model simulations should allow for the improved deconvolution of the roles played by sea surface temperature and hydrological cycle variability in the proxy 'ENSO' signals recorded in tropical Pacific corals. An additional, complementary approach is the development of new proxy data-sets from regions particularly sensitivity to certain aspects of the modern ENSO phenomenon, in this case sea surface temperature sensitive coral records from the heart of the eastern Pacific cold tongue. This presentation will focus on strategies for the inter-comparison of CMIP5 GCM simulations and paleo-proxy data over the mid/late Holocene, with the underlying aim being to better constrain 'natural' ENSO variability on adaptation relevant time-scales.