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Modeling the ENSO continuum using multivariate red noise

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Using a multivariate, "patterns-based", red noise approach to 42 years of observed tropical SST, thermocline depth, and zonal wind stress seasonal anomalies, Newman et al. (2011) showed that natural random variations can account for the observed variability of Central Pacific (CP) and Eastern Pacific (EP) ENSO events, with a continuum of ENSO "flavors" the consequence of differing combinations of two initially orthogonal spatial patterns that are precursors to CP or EP events of both signs. These precursors can be excited by random weather forcing and subsequently result in SST anomaly amplification primarily through surface or thermocline feedbacks, respectively. Thus, the recent multidecadal increase in the number of CP events relative to EP events, which has been hypothesized to be connected to anthropogenic change in the state of the ocean, is also consistent with multivariate red noise and hence with stationary statistics. In this presentation, the above approach is discussed and also applied to a few very long ($\sim$1000 yr) pre-industrial control runs from the CMIP5 archive. This allows not only a comparison of the dynamics leading to CP/EP differences in the models vs. observations, but also allows an estimation of the impact of the short observational record on the results.