



Characterising the El Niño continuum and the potential for ENSO forecasts near the spring predictability barrier

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Based on the NCEP-NOAA 1980-2014 reanalysis we show that El Niño is a continuum with Central and Eastern Pacific El Niños as end members. Most El Niños are in between these end members. This continuum can be characterised to a large extent by just two parameters: the Western Pacific subsurface oceanic potential temperature anomaly and the West to Central Pacific Cumulative zonal wind anomaly. From a linear combination of these two parameters a simple statistical model can be developed for ENSO forecast that is comparable or even outperforms other statistical models, particularly during the boreal spring predictability barrier. The explained variance between observed and predicted November to January Niño3.4 sea surface temperature anomalies is 57% at a lead time of 8 months whereas for other considered models this is 50% at best. No false positives are predicted. Predictive skills drop after the 2000 climate regime shift but not as much as for other statistical models. Applying the same statistical model to the Earth System Model of the Max Planck Institute to Meteorology (MPI-ESM) reveals that the MPI-ESM produces a much weaker West Pacific recharge state that lacks much of the observed thermocline feedback mechanism.