



A tropical mechanism for ENSO modulation

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The source of the ENSO modulation, i.e. the change in ENSO properties and statistics at decadal timescale remains unclear. Whereas, some argues that ENSO is influenced by the oceanic and atmospheric variability of the mid-latitudes, others consider the tropical Pacific as a closed basin in which non-linear advection can provide energy to ENSO at low frequency. The difficulty for addressing such issue lies in part to the fact that the changes in thermocline depth at decadal timescales are weak. On the other hand, the changes in density in the vicinity of the thermocline in the warm pool region are significant. Here, we used the SODA oceanic Reanalysis to document the thermocline variability at decadal timescale. It is shown that part of this subsurface variability corresponds to the linear response of the ocean to the wind forcing. It also exhibits an asymmetry that results from the ENSO nonlinearity. It is suggested that the change in mean state as observed in the vicinity of the thermocline produces the ENSO asymmetry through the equatorial wave dynamics. A tropical mechanism for ENSO modulation is then proposed based on experiments from an hybrid coupled model. The role of atmospheric noise on the characteristics of ENSO modulation in the hybrid coupled model is also investigated.