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ENSO dynamics and diversity resulting from the recharge oscillator interacting with the slab ocean

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El Nino–Southern Oscillation (ENSO) is the leading mode of interannual global climate variability, which in its essence is often described by the equatorial dynamics of the recharge oscillator with a fixed pattern. Here we explore the idea that ENSO can be simulated in a model with a fixed pattern of sea surface temperature variability following the recharge oscillator mechanism, which interacts with the thermodynamic red noise of a slab ocean. This model is capable of simulating the leading modes of sea surface temperature variability in the tropical Pacific in good agreement with the observations and most coupled general circulation models. ENSO dynamics, amplitude, seasonality, the structure of the leading patterns, its meridional extension, its variations in an eastern and central Pacific pattern and associated positive feedbacks are all influenced and simulated well by including the interaction of recharge oscillator and the thermodynamic coupling to the slab ocean model. We further point out that much of the ENSO diversity in the spatial structure is a reflection of this interaction. However, it also has to be noted that some equatorial dynamics are missing in this model and in coupled general circulation models that are important for the ENSO diversity.