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Phase dependence of the ENSO recharge oscillator: models versus observations

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The recharge oscillator views ENSO as a two-dimensional dynamical system. The two variables are the eastern Pacific SST and the mean equatorial Pacific thermocline depth. We determine the period and the decay scale of the recharge oscillator both in observational data and in several general circulation model output data sets. The data sets show some remarkable differences in the recharge oscillator parameters. Next, non-linear fits are made where the parameters of the recharge oscillator depend on the ENSO phase. While the overall cycle is stable, part of the cycle can be unstable, giving rise to the rapid development of El Niño's. Similarly, phase progression varies during the ENSO cycle. Finally, we use the recharge oscillator framework to give estimates for the predictability of ENSO that depend on ENSO phase and season.