A coupled seasonal-cycle interaction theory on the El Niño-Southern Oscillation

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Abstract

Principal component analyses of the mean-removed standard-deviation-normalized global tropical monthly mean sea surface temperature (SST) and 850 hPa velocity potential fields between 1956 and 2005 reveal that the dominant El Niño-Southern Oscillation (ENSO) related variability in each field is explained by two leading empirical normal modes. The principal components of these two modes show distinct features similar to the solutions for a two-mass, three-spring system. Based on these results, a coupled seasonal-cycle interaction theory is proposed to explain the causes of quasi-periodicity, irregularity and seasonal phase-locking phenomena in ENSO.