ENSO diversity in the GFDL CM2.1 coupled GCM

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A 4000-year pre-industrial control integration of the GFDL CM2.1 coupled GCM produces a wide range of ENSO behavior, mimicking the diversity of events seen in nature. The simulated ENSO behavior generally spans a continuum, although it does exhibit some mild bimodality in the longitude and timing at which peak SST anomalies occur. The simulated ENSO also exhibits interesting extremes. Compared to cold events and weak warm events, strong warm events exhibit distinct spatial patterns, teleconnections, seasonal timing, and mechanisms, with (1) a greater role for Bjerknes & thermocline feedbacks during the onset and decay phases; (2) a greater tendency to exhibit SST anomalies that peak in the eastern Pacific and at the end of the calendar year; (3) stronger discharge of equatorial ocean heat content during the event, with a larger role in the mixed layer heat budget relative to air-sea heat fluxes; (4) a greater likelihood of the event's decay overshooting into an event of opposite sign; and (5) a greater temporal isolation from prior and subsequent events of the same sign. We will discuss the differing dynamics of these extremes, and their implications for evaluating ENSO simulations and assessing future ENSO risks.