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Dynamics of El-Niño: Is it stochastic or deterministic?

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We analyze Niño3 data which are sea-surface temperature (SST) data averaged over the Eastern Pacific. Our goal is to better understand the phenomenon of El-Niño, particularly, if it can be predicted. We use the same model as Ghil et al. (2008), which consists of a nonlinear time-delay differential equation (DDE), which is forced by a periodic term. In addition, we add a white noise term. The nonlinearity in the equation describes the coupling between the ocean and the atmosphere. Further, we use a test for determinism developed by Kaplan and Glass (1992), and compare the outcome of this test for Niño3 data and for the simulation. We see that the inclusion of the stochastic term is mandatory, but its strength varies for different time delays in the DDE, as well as for different strengths of coupling between the atmosphere and the ocean.

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