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Atmosphere-ocean interactions at strong couplings in a simple model of El Nino

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The understanding of the dynamics of the El Nino/La Nina phenomenon in the tropical Pacific has been the subject of an impressive number of works in the last 20 years. The delayed oscillator theory provides an interpretative framework that has allowed enormous advances in our understanding. Much evidence that stochastic forcing does play a role in the dynamics of ENSO has been discussed and it is possible to shape a theory of El Nino as a stochastically forced linear system. However it is still uncertain if El Nino is a self-sustained nonlinear oscillatory system, a chaotic system or a stochastically forced linear system. We propose in this paper that it is possible to have realistic El Nino probability distributions assuming that the system is a nonlinear stochastically forced system. In this paper a simple system is proposed that retains the main characteristics of the El Nino - La Nina variations, like the skewness and the autocorrelation, and we also show how solutions for the probability distribution can be obtained using a Fokker-Planck equation.