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ENSO instability revisited

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The effect of state-dependent noise, representing westerly wind burst activity, on the El Nino-Southern Oscillation is studied by developing numerical and analytical solutions of the Fokker-Planck equation. A noise-induced instability is identified for ENSO that leads to a shift of the deterministic Hopf Bifurcation. This effect is also known as a stochastic Hopf bifurcation. Furthermore, the effect of slowly varying climate background conditions on ENSO is studied in the framework of dynamical bifurcations. Near the Hopf bifurcation point the real part of the leading eigenvalue aproaches zero, which prevents any damping of transients. The critical-slowing down effect in non-equilibrium simulations leads to a weathering of the parameter boundary between stable and unstable ENSO regimes.