1035-37-1713 **Michael Ghil*** (ghil@lmd.ens.fr), Geosciences Department, Ecole Normale Superieure, 24 rue Lhomond, 75231 Paris Cedex 05, France, and **Mickael Chekroun**, **Eric Simonnet** and **Ilya Zaliapin**. *Robust climate projections and stochastic structural stability of dynamical systems.* Preliminary report.

General circulation models (GCMs) are very detailed models of climate change. Still, the GCMs' sensitivity to initial data and complex nonlinearities are a stubborn obstacle to narrowing the range of future warming projections. Brute-force tuning the large number of GCM parameters does not appear to help reduce the uncertainties.

Andronov and Pontryagin (1937) proposed structural stability as a way to evaluate model robustness. Unfortunately, many real-world systems proved to be structurally unstable.

We illustrate these concepts with a very simple model for the El Niño-Southern Oscillation (ENSO). Our model is governed by a differential delay equation with a single delay and periodic (seasonal) forcing. Like many of its more or less detailed and realistic precursors, this model exhibits a Devil's staircase. We study the model's structural stability, describe the mechanisms of the observed instabilities, and connect our findings to ENSO phenomenology.

We apply the tools of random dynamical systems and stochastic structural stability to the circle map and a torus map. The effect of noise with compact support on these maps is fairly intuitive: it is the most robust structures in phase-parameter space that survive the smoothing introduced by the noise. GCMs are next ... (Received September 20, 2007)