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Grindelberg 5, 20144 Hamburg, Hamburg, Germany. *Bistable systems with Stochastic Noise:  
Virtues and Limits of effective Langevin equations for the Thermohaline Circulation strength.*

The understanding of the statistical properties and of the dynamics of multistable systems is gaining more and more importance in a vast variety of scientific fields. This is especially relevant for the investigation of the tipping points of complex systems. Sometimes, in order to understand the time series of given observables exhibiting bimodal distributions, simple 1D Langevin models are fitted to reproduce the statistical properties, and used to investigate the projected dynamics of the observable. In this paper, we propose a framework for encasing this kind of studies and show, using simple box models of the oceanic circulation and choosing as observable the strength of the thermohaline circulation. We study the statistical properties of the transitions between the two modes of operation of the thermohaline circulation under symmetric boundary forcing and test their agreement with simplified one-dimensional phenomenological theories. We extend our analysis to include stochastic resonance-like amplification processes. We conclude that fitted 1D Langevin models, when closely scrutinised, may result rather ad-hoc. They should be treated with care, more as an empiric descriptive tool than as methodology with predictive power. (Received September 22, 2011)