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Weather, macroweather and statistical properties for a spatially heterogeneous 1D energy balance model

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A one-dimensional energy balance model (1D-EBM) is a simplified climate model that describes the evolution of Earth's temperature based on the planet's energy budget.

In this study, we examine a 1D-EBM that incorporates a parameter representing the impact of carbon dioxide on the energy balance. Based on empirical studies showing that bistability may occur in Earth's tropics, we consider the planet's ongoing radiation to be latitude-dependent, presenting bistability in low-latitude regions but not in high-latitude ones. This local bistability does not lead to a bifurcation in the entire system, in addition to the classical saddle-node bifurcations between Snowball Earth and the present climate.

We focus on investigating the statistical properties of the system when the model is perturbed with additive noise. Our work is a step towards a clearer understanding of the dynamics in a spatially heterogeneous setting.

Joint ongoing research with F. Flandoli.

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