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Self-Organized Criticality, phase transition, and the moisture and rain rate in the tropics[1] SATOMI SUGAYA, Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM, JOSEPH GALEWSKY, Department of Earth Sciences,University of New Mexico, Albuquerque, NM, SHARON SESSIONS, Department of Physics, New Mexico Institute of Mining and Technology, Socorro, NM — Self-Organized Criticality (SOC) has been proposed as a potential framework to describe the relationship between the moisture and rain rate in the tropics (Peters and Neelin 2006). The authors claimed that the relationship can be seen as a second order phase transition happening in nature. Hence the system was said to self-organize towards the critical phase transition. However, this view is an issue of debate (see Bretherton et al. 2004; Muller et al. 2009). Although SOC lacks a clear definition (Jensen 1998), it has come to known as a phenomenon that describes a certain set of dissipative dynamical systems which have two phases, stable and dissipative. The dissipative phase onsets when the threshold for stored energy of the stable phase is surpassed. The dissipative phase works to relax this excess energy and restores the system to its stable configuration. The interplay between the dissipative and the stable phases of a system produces a power-law distribution in the magnitude of the dissipative events. From this perspective, SOC does not involve a phase transition as observed in equilibrium systems. Therefore, although the suggested evidence for the SOC theory for tropical moisture dynamics may well qualify for second order phase transition, they do not qualify for SOC phenomenon.

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