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Renormalization group in a model of self-organized criticality: Anisotropic system in isotropic environment

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The phenomenon of self-organized criticality (SOC) consists in the emergence of scaling in open nonequilibrium systems with dissipative transport. Unlike equilibrium systems that arrive at critical states when control parameters approach their critical values, systems with SOC evolve to critical states due to their intrinsic dynamics. Such systems are widespread in nature with SOC being observed in physical, biological, economic and social systems. Critical behavior of stochastic system can be drastically affected by turbulent motion of the environment, thus, it is important to study the motion influence on systems with SOC. In this report, it was presented a field theoretic renormalization group analysis of the continuous anisotropic model of SOC introduced in (a “running sandpile”) coupled to the stochastic Navier–Stokes equation. The model provides an example of competition between strongly anisotropic intrinsic dynamics and external isotropic disturbance by the turbulent environment.

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