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Power-law statistics in beam-driven plasma-wave system with fluctuations: a signature of self-organized criticality, or something else?[1]
YU. TYSHETSKIY, J.A. ROBERTS, P.A. ROBINSON, I.H. CAIRNS, B. LI, University of Sydney — Numerical simulations of reduced-parameter model [1] of stochastic growth theory (SGT) [2] describing beam-driven plasma-wave systems with parameter fluctuations, display power-law tails in wave energy distribution function P(W) for certain parameters of the model. The characteristic spatiotemporal linear correlation scales of the system quantities [3], estimated at these parameters, are large compared to both the correlation scales of fluctuations driving the system, and to the system size, possibly indicating criticality occurring in the system. We study whether these power-law tails and diverging correlation scales are indeed signatures of criticality, whether this state is robust to fluctuations and initial conditions (and hence criticality is self-organized [4]), and what model parameters define the transition into the power-law regime from the previously well studied regime of SGT with lognormal statistics [2]. We also measure exponents of the power-law tails and study their dependence on the model parameters. References: [1] P. A. Robinson, Solar Phys. **168**, 357 (1996). [2] P. A. Robinson, Phys. Plasmas **2**, 1466 (1995). [3] Yu. Tyshetskiy et al., "Spatiotemporal correlation functions in beam-driven plasmas with fluctuations", submitted to Phys. Plasmas. [4] P. Bak, C. Tang, and K. Wiesenfeld, Phys. Rev. Lett. **59**, 381 (1987).

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