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Effects of turbulent mixing and static noise in Hwa-Kardar model of self-organised criticality

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The Hwa-Kardar model of self-organised criticality is studied by the renormalization group analysis. The noise in the model under consideration is quenched, i.e., Gaussian one with correlation function $\langle ff \rangle \propto \delta^{(d)}(\mathbf{x} - \mathbf{x}')$, where both $\mathbf{x}$ and $\mathbf{x}'$ are spatial coordinates and no dependence on time is presented. The effects of turbulent motion of the environment are taken into account. The advecting velocity field is described by Gaussian ensemble with finite correlation time.

Critical exponents are calculated in one-loop approximation. We show that depending on the relation between the exponent describing scaling behavior of the velocity field and the spatial dimension d, the system reveals different types of large-scale, long-time scaling behaviour, associated with the possible fixed points of the renormalization group equations.

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