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# Dynamical renormalization group study for a class of non-local interface equations

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**Abstract-**

**We provide a detailed dynamic renormalization group study for a class of stochastic equations that describe non-conserved interface growth mediated by non-local interactions. We consider explicitly both the morphologically stable case, and the less studied case in which pattern formation occurs, for which flat surfaces are linearly unstable to periodic perturbations. We show that the latter leads to non-trivial scaling behavior in an appropriate parameter range when combined with the Kardar-Parisi-Zhang (KPZ) nonlinearity, which nevertheless does not correspond to the KPZ universality class. This novel asymptotic behavior is characterized by two scaling laws that fix the critical exponents to dimension-independent values, which agree with previous reports from numerical simulations and experimental systems. We show that the precise form of the linear stabilizing terms does not modify the hydrodynamic behavior of these equations. One of the scaling laws, usually associated with Galilean invariance, is shown to derive from a vertex cancellation that occurs (at least to one loop order) for any choice of linear terms in the equation of motion and is independent of the morphological stability of the surface, hence generalizing this well-known property of the KPZ equation. Moreover, the argument carries over to other systems such as the Lai-Das-Sarma-Villain equation, in which vertex cancellation is known not to imply an associated symmetry of the equation.**

**Index Terms- growth instabilities (theory), kinetic roughening (theory), self-affine roughness (theory)**



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