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# On the origin of multiscaling in stochastic-field models of surface growth

R. Gallego, M. Castro, J.M. López

**Abstract— Multiscaling appears in some non-equilibrium systems when different moments of a bulk averaged state variable scale with different and nontrivial exponents. This multiexponent scaling behaviour is highly nontrivial and is associated with different fractal properties at different observation scales. It is unclear what kind of generic mechanisms could make multiscaling to emerge in continuous hydrodynamic descriptions of dynamical systems with only local interactions, governed by partial-differential equations, in the continuum. Here we present an extensive numerical study of a continuous model of epitaxial thin-film growth, which main characteristic is that it includes infinitely many nonlinearities. For strong enough nonlinearity, the model shows effective multiscaling over a range of time/length scales, while normal monoscaling is actually recovered at long wavelengths. We conjecture that the existence of infinitely many weakly relevant nonlinear terms may lead to this nontrivial scaling behaviour in a generic way.**

**Index Terms— Statistical and Nonlinear Physics**



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