

Unstable Nonlocal Interface Dynamics

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Abstract— Nonlocal effects occur in many nonequilibrium interfaces, due to diverse physical mechanisms like diffusive, ballistic, or anomalous transport, with examples from flame fronts to thin films. While dimensional analysis describes stable nonlocal interfaces, we show the morphologically unstable condition to be nontrivial. This is the case for a family of stochastic equations of experimental relevance, paradigmatically including the Michelson-Sivashinsky system. For a whole parameter range, the asymptotic dynamics is scale invariant with dimension-independent exponents reflecting a hidden Galilean symmetry. The usual Kardar-Parisi-Zhang nonlinearity, albeit irrelevant in that parameter range, plays a key role in this behavior.

Index Terms—

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