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Noise induced transitions in rugged energy landscapes MARC PRADAS, Department of Mathematics and Statistics, The Open University, ANDREW DUNCAN, Department of Mathematics, Imperial College London, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London, GREG PAVLIOTIS, Department of Mathematics, Imperial College London
— External or internal random fluctuations are ubiquitous in many physical and technological systems and can play a key role in their dynamics often inducing a wide variety of complex spatiotemporal phenomena, including noise-induced spatial patterns and noise-induced phase transitions. Many of these phenomena can be modelled by noisy multiscale systems characterized by the presence of a wide range of different time- and lengthscales interacting nontrivially with each other. Here we analyse the effects of additive noise on systems that are described in terms of a rugged energy landscape, modelled as a slowly-varying multiscale potential perturbed by periodic multiscale fluctuations. Some examples of this problem include the dynamics of sessile droplets on heterogeneous substrates, crystallization and the evolution of protein folding. We demonstrate that the interplay between noise and the small scale fluctuations in the potential can give rise to a dramatically different bifurcation structure and dynamical behaviour compared to that of the original, unperturbed model. For instance, we observe several nontrivial and largely unexpected dynamic-state transitions controlled by the noise intensity. We characterize these transitions in terms of critical exponents.

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