Brownian Motion in a Multiscale Potential

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Abstract

In this talk we consider the problem of Brownian motion in a rough potential, modelled as a slowly-varying potential perturbed by periodic multiscale fluctuations. We show that the effective behaviour of this model can be described by an overdamped Langevin equation possessing multiplicative noise, for which detailed balance with respect to a coarse grained invariant measure will hold. We demonstrate how the small scale fluctuations in the potential can give rise to dynamical behaviour which is qualitatively different from that of the original, unperturbed model, and through numerical examples and analysis we will explore this behaviour in a number of regimes, particularly in the limit of increasingly many length scales. This is joint work with Serafim Kalliadasis (Imperial College), Marc Pradas (Open University) and Grigorios Pavliotis (Imperial College).