
Brownian Motion in a Multiscale Potential

Andrew Duncan^{*1}, Serafim Kalliadasis², Marc Pradas³, and Grigorios Pavliotis¹

¹Department of Mathematics [Imperial College London] – Department of Mathematics South Kensington Campus Imperial College London SW7 2AZ London UK, United Kingdom

²Imperial College London – Department of Chemical Engineering, Imperial College London, London SW7 2AZ, UK, United Kingdom

³The Open University (OU) – Department of Mathematics and Statistics, The Open University, Milton Keynes, MK7 6AA. UK., United Kingdom

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).

^{*}Speaker