VI Encontro da Pós-Graduação em Matemática da UFBA
26 a 30 de novembro de 2018

WEAKLY ASYMMETRIC EXCLUSION WITH A SINK: CROSSOVER TO STOCHASTIC BURGERS

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Abstract

We consider the weakly asymmetric simple exclusion process on $\mathbb{Z}$ with asymmetry strengthen $\frac{1}{2} \pm \frac{A}{2n^\gamma}$ with the following additional *sink* dynamics: at Poisson times, the sites $\{-1, 0\}$ are suppressed; immediately after that, the sites $x \geq 1$ are shifted to the left by one, and the sites $x \leq -2$ are shifted to the right by one. The system is taken from the (non reversible) invariant state, which is the Bernoulli product measure of parameter $\rho \in (0, 1)$.

Let $\alpha n^{-\beta}$ ($\alpha \in \mathbb{R}$ and $\beta \geq 1$) be the strengthen of the sink dynamics and consider the system under the diffusive time scaling tn^2. Under the strong asymmetry $\gamma = \frac{1}{2}$ the scheme of results is the following: at the critical value, $\beta = 1$, the limit density fluctuation field is an energy solution of the stochastic Burgers equation with a Dirichlet boundary condition at zero and drift of intensity α towards the origin. For $\beta > 1$, the limit is an energy solution of the stochastic Burgers equation on the line. Under a weaker asymmetry, i.e., $\gamma > \frac{1}{2}$, the scheme of results is same as before, but with the generalized Ornstein-Uhlenbeck process in lieu of the stochastic Burgers equation.

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