On Random Conductance Models with Stable-like Long Range Jumps

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Abstract

In this talk, we summarize some recent progress on random conductance models with stable-like long range jumps. In particular we consider conductances

$$C_{xy} = \omega_{xy}|x-y|^{-d-\alpha}$$

for distinct $x, y \in \mathbb{Z}^d$ and $0 < \alpha < 2$, where $\omega := \{\omega_{xy} = \omega_{yx} : x, y \in \mathbb{Z}^d\}$ are non-negative independent random variables with mean 1. We prove that under some moment conditions for ω, suitably rescaled Markov chains among the random conductances converge to a rotationally invariant symmetric α-stable process almost surely w.r.t. the randomness of the environments. We also establish two-sided heat kernel estimates for large time almost surely w.r.t. the randomness of the environments, and claim that (elliptic) Harnack inequalities do not hold in the present setting. If time permits, we also briefly mention recent topics on homogenization problems of symmetric stable-like processes in stationary ergodic medium. The proof is a combination of analytic and probabilistic methods based on the recently established de Giorgi-Nash-Moser theory for symmetric jump processes.