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Seminário de sistemas dinâmicos e estocásticos

IMECC - UNICAMP

Título: Brownian particle in the curl of 2-d stochastic heat equations.

Guilherme de Lima Feltes

University of Munster

Resumo:

We study the long time behaviour of a Brownian particle evolving in a dynamic random environment. Recently, [G. Cannizzaro, L. Haunschmid-Sibitz, F. Toninelli, Ann. Probab. 2022] proved sharp $\sqrt{log}$-super diffusive bounds for a Brownian particle in the curl of (a regularisation of) the 2-d Gaussian Free Field (GFF) $\underline{\omega}$. We consider a one parameter family of Markovian and Gaussian dynamic environments which are reversible with respect to the law of $\underline{\omega}$. Adapting their method, we show that if $s \geq 1$, with $s = 1$ corresponding to the standard stochastic heat equation, then the particle stays $\sqrt{log}$-super diffusive, whereas if $s < 1$, corresponding to a fractional heat equation, then the particle becomes diffusive. In fact, for $s < 1$, we show that this is a particular case of [T. Komorowski, S. Olla, J. Func. Anal., 2003], which yields an invariance principle through a Sector Condition result. Our main results agree with the Alder-Wainwright scaling argument (see [B. Alder, T. Wainright, Phys. Rev. Lett. 1967]) used originally in [B. Toth, B. ValkÃ^3, *J.Stat.Phys.*, 2012]*topredictthe*log-corrections to diffusivity. We also provide examples which display log^a-super diffusive behaviour for $a \in (0, 1/2]$.