Séminaire de Probabilités et Statistique

Mardi 10 octobre 2023 à 14h00

Salle de conférences

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Fractional diffusion limit for a kinetic Fokker-Planck equation with diffusive boundary conditions in the half-line.

We consider a particle with position $(X_t)_{t\geq 0}$ living in $\mathbb{R}_+$, whose velocity $(V_t)_{t\geq 0}$ is a positive recurrent diffusion with heavy-tailed invariant distribution when the particle lives in $(0,\infty)$. When it hits the boundary $x = 0$, the particle restarts with a random strictly positive velocity. We show that the properly rescaled position process converges weakly to a stable process reflected on its infimum. From a P.D.E. point of view, the time-marginals of $(X_t, V_t)_{t\geq 0}$ solve a kinetic Fokker-Planck equation on $(0,\infty) \times \mathbb{R}_+ \times \mathbb{R}$ with diffusive boundary conditions. Properly rescaled, the space-marginal converges to the solution of some fractional heat equation on $(0,\infty) \times \mathbb{R}_+$.