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Pierre LE DOUSSAL / Alexandre KRAJENBRINK - Large deviations for diffusion in random media: integrable crossover from macroscopic fluctuation theory to weak noise KPZ equation.

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The large deviations for the diffusion of a tracer in a 1D time dependent medium can be described, on diffusive scales,

by the macroscopic fluctuation theory (MFT).

The corresponding MFT variational equations are mapped to the integrable derivative non-linear Schrodinger equation. We provide a solution using inverse scattering methods, and obtain the large deviation rate function for the sample to sample fluctuation of the probability of the tracer position.

Furthermore by varying the position of the tracer, i.e. the asymmetry, we uncover the full integrable crossover from the MFT to the weak noise theory of the KPZ equation, matching our previous results for the latter problem.

Based on

Krajenbrink, A., & Le Doussal, P. (2023). Crossover from the macroscopic fluctuation theory to the Kardar-Parisi-Zhang equation controls the large deviations beyond Einstein's diffusion. *Physical Review E*, 107(1), 014137.

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