

SUPERDIFFUSION FOR BROWNIAN MOTION WITH INCOMPRESSIBLE RANDOM DRIFT

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I consider the long-time behavior of a diffusion process on \mathbb{R}^d advected by a stationary random vector field, which is assumed to be divergence-free, dihedrally symmetric in law, and have a log-correlated potential. A particular case is ∇^\perp of the Gaussian free field in two dimensions. We show that the system has quenched superdiffusive scaling. I will also discuss some recent and ongoing work on the theory of high-contrast homogenization. In the process, we have developed a renormalization procedure, which is expected to have applications in mathematical physics beyond this setting. This is a joint work with S. Armstrong and A. Bou-Rabee.