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Convergence rates for the incompressible limit of nonlinear diffusion equations

Nowadays a vast literature is available on the Hele-Shaw or incompressible limit for nonlinear degenerate diffusion equations. This problem has attracted a lot of attention due to its applications to tissue growth and crowd motion modelling as it constitutes a way to link soft congestion (or compressible) models to hard congestion (or incompressible) descriptions. Nevertheless, little is known about the rate of convergence of this asymptotic. In this talk, I will address the question of estimating the rate in the presence of external drifts. In a joint work with Tomasz Dębiec and Benoit Perthame, we computed the rate in a negative Sobolev norm for generic bounded potentials, while in a work in progress with Alpár Mészáros and Filippo Santambrogio, we provide improved results in the 2-Wasserstein distance which are global in time thanks to the contractivity property that holds for strictly convex potentials. I will present these two results, which hold both for the barotropic pressure law (hence the porous medium equation) and for a singular pressure law with density constraints.

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Classification de thématique: Exposés