Hydrodynamic limit for fast diffusion equation

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Resumo/Abstract:
We obtain a conservative interacting particle system whose macroscopic density profile evolves according to the partial differential equation

$$\begin{cases} \partial_t \rho(t,u) \;=\; \Delta\Big(\dfrac{1}{\rho(t,u)}\Big) \\ \rho(0,\cdot) \;=\; \rho_0(\cdot)\ . \end{cases} \tag{1}$$

This equation can be rewritten in the divergence form as

$$\partial_t \rho(t,u) = \nabla(D(\rho(t,u))\nabla(\rho(t,u))),$$

Because of the fact that diffusion coefficient $D(\rho(t,u)) = \rho^{-2}(t,u)$ goes to infinity as $\rho \to 0$, equation (**??**) is called **Fast Diffusion Equation** (FDE). Using the relative entropy method, we obtain FDE as hydrodynamic limit of a zero-range process with *symmetric unit rate*. In order to capture the explosion of the diffusion coefficient, we consider a model with a typically high number of particles per site. This is a joint work with F. Hernndez (UFF) and M. Jara (IMPA).