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A Free Boundary Problem in Optimal Transportation

We are going to study the regularity of the minimizer u of the energy functional $E(u) = \int |\nabla u|^2 + d^2(u, u_0)$ in the periodic case, where d is the Monge-Kantorovic distance between two probabilities and u_0 is a given density. Formally, the Euler-Lagrange equation is a nonlinear fourth order PDE for which the maximum principle does not apply. We are also going to investigate the free boundary of the zero set of u if u_0 is nice, say bounded away from 0 and ∞ .