

Stability of the density patches problem with vacuum for incompressible inhomogeneous viscous flows

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Abstract

The talk will be based on a recent joint work with Piotr B. Mucha and Raphael Danchin. We consider the inhomogeneous incompressible Navier-Stokes system in a smooth two or three dimensional bounded domain, in the case where the initial density is only bounded. Existence and uniqueness for such initial data was shown recently by R. Danchin and P.B. Mucha, but the stability issue was left open. The point is that the difference of initial densities may be non-zero on a set where one of the densities vanishes, therefore the proof on uniqueness does not imply stability, like in case without vacuum. In the talk I will focus on the issue of stability. After observing that the solutions have exponential decay, a result of independent interest, we prove the stability with respect to initial data, first in Lagrangian coordinates, and then in the Eulerian frame. In particular, our stability estimates are not weighted by the initial densities. Hence, our result applies in particular to the classical density patches problem, where the density is a characteristic function.