

Global unique solutions for the inhomogeneous Navier-Stokes equation with only bounded density, in critical regularity spaces

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Abstract

Our work is to prove the global existence and uniqueness of solutions to the inhomogeneous incompressible Navier-Stokes system in the case where the initial density ρ_0 is discontinuous and the initial velocity u_0 has critical regularity. Assuming that ρ_0 is close to a positive constant, we obtain global existence and uniqueness in the two-dimensional case whenever the initial velocity u_0 belongs to the critical homogeneous Besov space $B_{p,1}^{-1+2/p}(\mathbb{R}^2)$ ($1 < p < 2$) and, in the three-dimensional case, if u_0 is small in $B_{p,1}^{-1+3/p}(\mathbb{R}^3)$ ($1 < p < 3$).