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The inviscid limit in the Cauchy problem of the inhomogeneous incompressible

Navier-Stokes equations

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Abstract

Applying a similar arguments as introduced in Bona-Smith [4], we mainly study the inviscid limit of the inhomogeneous incompressible Navier-Stokes equations in \mathbb{R}^d . Some results of local uniform estimates on solutions of the Navier-Stokes equations, independent of the viscosity, are also obtained.

Key Words: Inviscid limit; Navier-Stokes equations; Besov spaces

Mathematics Subject Classification (2010): 35Q35; 35Q30; 35Q31

1. Introduction and the main result

In this paper, we study the inviscid limit in the Cauchy problem of the inhomogeneous incompressible Navier-Stokes equations in \mathbb{R}^d

$$\begin{cases} \partial_{t}\rho^{\varepsilon} + \operatorname{div}(\rho^{\varepsilon}u^{\varepsilon}) = 0, \\ \partial_{t}(\rho^{\varepsilon}u^{\varepsilon}) + \operatorname{div}(\rho^{\varepsilon}u^{\varepsilon} \otimes u^{\varepsilon}) - \varepsilon \Delta u^{\varepsilon} + \nabla \Pi^{\varepsilon} = 0, \\ \operatorname{div} u^{\varepsilon} = 0, \\ (\rho^{\varepsilon}, u^{\varepsilon})|_{t=0} = (\rho^{\varepsilon}_{0}, u^{\varepsilon}_{0}). \end{cases}$$

$$(1.1)$$

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