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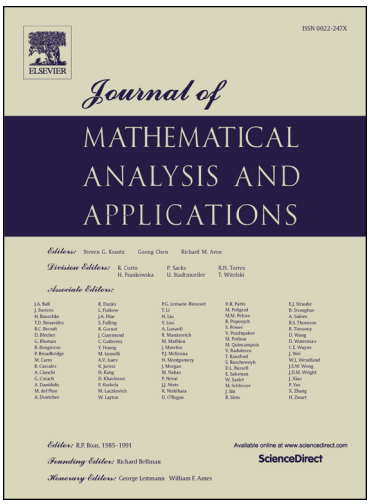

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Xiaoping Zhai, Boling Guo, Fei Chen

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The inviscid limit in the Cauchy problem of the inhomogeneous incompressible Navier-Stokes equations

Xiaoping Zhai[†], Boling Guo[‡] and Fei Chen[‡*]

[†]School of Mathematics and Statistics, Shenzhen University,

Shenzhen, Guangdong 518060, China

[‡] Institute of Applied Physics and Computational Mathematics,

Beijing, 100088, China

[*] School of Mathematics and Statistics, Qingdao University,

Qingdao, Shandong 266071, China

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 $\mathbb{R}^d$

$$\begin{cases} \partial_t \rho^\varepsilon + \operatorname{div}(\rho^\varepsilon u^\varepsilon) = 0, \\ \partial_t(\rho^\varepsilon u^\varepsilon) + \operatorname{div}(\rho^\varepsilon u^\varepsilon \otimes u^\varepsilon) - \varepsilon \Delta u^\varepsilon + \nabla \Pi^\varepsilon = 0, \\ \operatorname{div} u^\varepsilon = 0, \\ (\rho^\varepsilon, u^\varepsilon)|_{t=0} = (\rho_0^\varepsilon, u_0^\varepsilon). \end{cases} \tag{1.1}$$

** Corresponding Author: feichenscut@163.com (F. Chen).

*** Email Address: pingxiaozhai@163.com (X.P. Zhai); gbl@iapcm.ac.cn (B.L. Guo); feichenscut@163.com (F. Chen).