

Oscillating and nonoscillating solutions of Navier-Stokes equations

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Homogenization of Navier-Stokes equations with periodic rapidly oscillating initial data and a vanishing viscosity will be discussed. We give homogenized equations whose solutions determine approximations (leading terms of the asymptotics) of the solutions of the equations under consideration and estimate the accuracy of the approximations. These approximations and estimates shed light on the following interesting property of the solutions of the equations. When the viscosity is not too small, the approximations contain no rapidly oscillating terms, and the equations under consideration asymptotically smooth the rapid oscillations of the data; thus, the equations are asymptotically parabolic. If the viscosity is very small, the approximations can contain rapidly oscillating terms with zero means, and the equations are asymptotically hyperbolic. Similar results for cases of nonstationary Stokes equations and Navier-Stokes equations with periodic rapidly oscillating forces were presented in [1,2]. In particular, the results are applicable to some Kolmogorov flows.

- [1] G. V. Sandrakov, *Izvestiya: Math.*, **71** (2007), p. 97–148.
- [2] G. V. Sandrakov, *J. Math. Sciences*, **143** (2007), p. 3377–3385.