

Navier-Stokes equations and Keller-Segel-Navier-Stokes equations

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The incompressible Navier-Stokes equations and Keller-Segel-Navier-Stokes equations are discussed. Firstly, for the case of steady-state Stokes system, local energy estimates are available near boundary without pressure, which allows to obtain local energy inequality for the Navier-Stokes equations up to boundary with no pressure. Secondly, the Green tensors of the stationary Stokes system in a half space are mentioned. Comparison to case of whole space is made and as an applications, spatial asymptotics of the Navier-Stokes equations are analyzed.

Regularity of non-stationary Navier-Stokes equations has attained lots of attention and some regularity criteria are referred. Like steady-case, we consider Cacciopoli type estimate of the non-stationary Stokes system, which is useful to construct a weak solution of the Navier-Stokes equations without pressure in the interior. In addition, solvability for non-zero boundary data is taken into account.

Lastly, we are concerned with Keller-Segel type system coupled to Navier-Stokes equations, which is a mathematical model describing the dynamics of oxygen, swimming bacteria, and viscous incompressible fluids. Existence of regular solutions and their temporal asymptotic profiles are examined.