MR731521 (86e:35122) 35Q10 (76D05)
Okamoto, Hisashi (J-TOKYO)
On the equation of nonstationary stratified fluid motion: uniqueness and existence of the solutions.
J. Fac. Sci. Univ. Tokyo Sect. IA Math. **30** (1984), *no. 3,* 615–643.

Let Ω be a bounded domain with smooth boundary in $\mathbf{R}^n$, where n is 2 or 3. The motion of a viscous inhomogeneous incompressible fluid with velocity u, pressure p, density ρ and viscosity 1 is governed by the system $\partial\rho/\partial t + u\cdot\nabla\rho = 0$, $\rho\{\partial u/\partial t + (u\cdot\nabla)u\} = \Delta u - \nabla p$, $\operatorname{div} u = 0$ $(0 < t;\ x\in\Omega)$ and the boundary conditions, where a and ρ_0 are data, $u|_{\partial\Omega} = 0$, $u|_{t=0} = a(x)$, $\rho|_{t=0} = \rho_0(x)$. O. A. Ladyzhenskaya and V. A. Solonnikov [J. Soviet Math. **9** (1978), 697–749; MR0425391 (54 #13347)] studied this boundary value problem using L^p norms with $p > n$ on $\{(t,x)\colon t = \text{const}, x\in\Omega\}$. The author uses L^2 norms for u and ∇u. He also proves local (in time) existence and uniqueness theorems, which also hold in the large for $n = 2$ and moreover for $n = 3$ and small initial data. He applies H. Fujita and T. Kato's method [Arch. Rational Mech. Anal. **16** (1964), 269–315; MR0166499 (29 #3774)].

Reviewed by *Jean Leray*