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On the initial value problem of the motion of compressible viscous fluid, especially on the problem of uniqueness

By

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§1. Introduction and main theorems

In this paper we shall discuss on the initial value problem of the fundamental system of differential equations for compressible viscous isotropic Newtonian fluid, especially setting more weight on the problem of the uniqueness of the solution. The system to be treated is as follows:

$$
\begin{cases}
(1.1)^1 \quad \dfrac{\partial\rho}{\partial t}+\operatorname{div}\rho v=0, \\[2ex]
(1.1)^2 \quad \dfrac{\partial v}{\partial t}=f-(v\cdot\nabla)v-\dfrac{1}{\rho}\cdot\nabla p+\dfrac{\mu}{\rho}\Delta v+\dfrac{\mu+\bar{\mu}}{\rho}\nabla\cdot\operatorname{div} v+\dfrac{1}{\rho}(\nabla\mu\cdot\nabla)v \\[2ex]
\qquad +\dfrac{1}{\rho}(\nabla v_k)\nabla_k\mu+\dfrac{\operatorname{div} v}{\rho}\nabla\bar{\mu}, \\[2ex]
(1.1)^3 \quad \dfrac{\partial\theta}{\partial t}=\dfrac{\kappa}{\rho C_V}\Delta\theta+\dfrac{1}{\rho C_V}(\nabla\kappa)\cdot\nabla\theta+\dfrac{\Psi(\nabla v)}{\rho C_V}-\dfrac{\operatorname{div} v}{\rho C_V}p_\theta\cdot\theta-(v\cdot\nabla)\theta,
\end{cases}
$$

(ρ, density >0; v, velocity vector; $\mu,\bar{\mu}$, viscosity coefficients $\left(\bar{\mu}+\frac{2}{3}\mu\geqq 0,\ \mu>0\right)$; p, pressure >0; θ, absolute temperature >0; C_V, specific heat at constant

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