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Global existence for viscous compressible fluids and their behavior as $t \to \infty$. (English)

Zbl 0785.35074
J. Fac. Sci., Univ. Tokyo, Sect. I A 40, No. 1, 17-51 (1993).

The authors prove local and global existence results for the initial- boundary value problem of the viscous compressible Navier-Stokes equation on a bounded domain with an arbitrary constitutive law between pressure and density.

The main results seem to be:

(i) A local existence result where the initial density is allowed to be nonnegative (and eventually not strictly positive) and bounded; here an L^2-condition for the initial density (instead of uniform strict positivity) is needed which means that the initial density should not become zero too badly.

(ii) A global existence result for small data under a strict uniform positivity assumption on the initial density and a strict monotonicity assumption for the pressure-density law; here the initial velocity should be in H^2, and the initial density must be in $H^{1,q}$ $(3 < q \leq 6)$.

(iii) If the forcing term has a potential which is small enough in a specific Sobolev space, and the constitutive relation between pressure and density is strictly monotone then the global solution tends to an equilibrium state as time becomes infinite.

For the proofs of these results the authors use a generalized Lax-Milgram lemma, and Schauder's fixed point theorem.

Reviewer: H.Lange (Köln)

MSC:

35Q30	Navier-Stokes equations
76N10	Existence, uniqueness, and regularity theory for compressible fluids and gas dynamics
35A07	Local existence and uniqueness theorems (PDE) (MSC2000)
35A05	General existence and uniqueness theorems (PDE) (MSC2000)

Cited in **65** Documents

Keywords:

global existence; initial-boundary value problem; viscous compressible Navier-Stokes equation; bounded domain; local existence; pressure-density law; generalized Lax-Milgram lemma; Schauder's fixed point theorem

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