Research

Colloquium

Global Existence of Classical Solutions for the Gas Flows Near Vacuum through Ducts Expanding with Space and Time

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摘　要：

In this study, we examine the global existence of classical solutions for the initial-boundary value problem of isentropic supersonic flows near vacuum through ducts that expand with space and time. The governing equations are compressible Euler equations with a sufficiently small variable parameter, which can be viewed as a hyperbolic system with a non-dissipative term when Riemann invariants are applied. We prove a couple of global existence theorems of classical solutions for non-dissipative hyperbolic balance laws under the suitable conditions of expanding ducts and the initial-boundary data whose C^0 norms can be large. The analysis depends primarily on the local existence theorem and on uniform a priori estimates, which are obtained by giving the maximum principle and introducing new generalized Lax transformations. Furthermore, the asymptotic behavior of global classical solutions is determined using the behavior of Riemann invariants along each characteristic curve and vertical line. Lastly, we explore the feasibility of the initial value problem for such expanding ducts.

This is joint work with Shih-Wei Chou and John M. Hong.