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Global classical solutions near vacuum to the compressible Euler equations for variable nozzle flow

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Abstract

In this talk, we study the global classical solutions of the nozzle flow near vacuum in terms of the Riemann invariants for compressible Euler equations. We present the solutions for two kinds of variable nozzles. One is the C^2 expanding nozzle corresponding to the initial value problem of the nozzle flow. The other case is the piecewise C^2 nozzles, which is related to an initial-boundary value problem. These results are established by the application of Lax-Li method. We first establish the local existence and then develop the uniform a priori estimate to the first-order derivatives of the Riemann invariants. The former is from the local existence theorem in ODE. The latter is to study the solutions of the Riccati equations induced from Riemann invariants. These results imply the global C^1 solutions of the nozzle flow near vacuum. Theoretic results are also supported by numerical simulations. This is a joint work with Jay Chu(NTHU), Hsin-Yi Lee (NCU) and Ying-Chieh Lin (NUK).