

Klein, R.

Semi-implicit extension of a Godunov-type scheme based on low Mach number asymptotics. I: One-dimensional flow. (English) Zbl 0842.76053
J. Comput. Phys. 121, No. 2, 213-237 (1995).

The author gives a detailed analysis of the limiting behavior of solutions of the Euler equations for compressible subsonic flow, with the Mach number approaching zero. A semi-implicit low Mach number extension of a Godunov-type MUSCL scheme for compressible flow is constructed with the aid of a single time but multiple space scales asymptotic analysis, which reveals three distinct roles of the pressure, namely its role as a thermodynamic variable, an acoustic wave amplitude, and the balance for the inertial forces in small scale flow structures. In addition to the development of the scheme, the paper contains a critical survey of the literature pertaining to the subject. It can be expected that the results of the analysis will definitely help to clarify alternative approaches in the development of solutions for incompressible flows and improve the rate of convergence for low Mach number solutions.

Reviewer: [E.Krause \(Aachen\)](#)

MSC:

[76M20](#) Finite difference methods applied to problems in fluid mechanics
[76N10](#) Existence, uniqueness, and regularity theory for compressible fluids and gas dynamics

Cited in **2** Reviews
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Keywords:

[Euler equations](#); [subsonic flow](#); [MUSCL scheme](#); [multiple space scales asymptotic analysis](#); [pressure](#); [thermodynamic variable](#); [acoustic wave amplitude](#)

Software:

[HLLE](#)

Full Text: [DOI](#)

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