Karni, Smadar

Hybrid multifluid algorithms. (English) Zbl 0860.76056

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A hybrid approach is presented for computing the dynamics of compressible multicomponent fluids, which is based on augmenting the Euler multicomponent equations by the pressure evolution equation. The extended system offers two choices for updating the pressure field: that is a conservative update, making use of the equation of state applied throughout the flow field except near material interfaces, where it may produce oscillations, and a nonconservative update, using the pressure evolution equation near interfaces to ensure monotone solution. A simple switching strategy between the two pressure update procedures is proposed. The resulting hybrid algorithm conserves the total mass and momentum of the system. The total energy is conserved with negligible errors. Results of numerical calculations are given for a two-component shock-tube problem. Solution has been obtained by means of the conservative flow model and by the present hybrid scheme.

Reviewer: Z.Dżygadło (Warszawa)

MSC:

76M20 Finite difference methods applied to problems in fluid mechanics
76T99 Multiphase and multicomponent flows
76N10 Existence, uniqueness, and regularity theory for compressible fluids and gas dynamics

Keywords:

compressible multicomponent fluids; Euler multicomponent equations; pressure evolution equation; equation of state; switching strategy; total mass; total energy; two-component shock-tube problem; conservative flow model

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