

Abstract Submitted
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All-Mach conservative scheme for transonic multiphase flows

MICHAEL KUHN, OLIVIER DESJARDINS, Cornell University — Transonic fluid flows pose significant challenges in computational simulations since the flow solver must be robust and accurate in subsonic, sonic, and supersonic regimes. Multiphase transonic flows amplify this difficulty even more, since the Mach numbers in each phase can be dramatically different, like in the case of a liquid jet in supersonic crossflow. Typically, advection schemes for sonic and supersonic flows introduce significant numerical dissipation, which allows the solver to be robust in the presence of shocks. However, this numerical dissipation means that kinetic energy is not conserved as the Mach number goes to zero and that turbulence cannot be represented accurately in the lower Mach regions of the flow. By utilizing a dissipative Semi-Lagrangian advection scheme with a centered kinetic-energy-conserving scheme and introducing a framework for switching between the two, we present work toward an all-Mach, multiphase-ready solver that conserves mass, momentum, and energy at all Mach numbers and conserves kinetic energy in the low Mach limit.

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