Abstract Submitted
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Comparison of Modern Methods for Shock Hydrodynamics[1] ANDREW COOK, LLNL — The accuracy and efficiency of several methods are compared for simulating multi-fluid compressible flows. The methods include a Godunov scheme, a Weighted Essentially Non-Oscillatory (WENO) method, an Arbitrary Lagrangian Eulerian (ALE) algorithm and a Spectral/Compact (S/C) scheme. Test problems include a compressible breaking wave, Shu's problem, Noh's problem, the Taylor-Green vortex, decaying turbulence, Rayleigh-Taylor instability and Richtmyer-Meshkov instability. The S/C method employs an artificial bulk viscosity for treating shocks and an artificial shear viscosity for modeling turbulence. A polyharmonic operator, applied to the strain rate, imparts spectral-like behavior to the viscosities, thus eliminating the need for ad hoc limiters and/or switches to turn them off in smooth regions, e.g., expansion, uniform compression, solid-body rotation etc. A low-pass filter is applied to the flow variables to reduce aliasing errors. The S/C method is demonstrated to capture shocks as well as the other schemes, while providing superior resolution of small features.

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