Abstract Submitted
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An artificial nonlinear diffusivity method for supersonic reacting flows with shocks[1] BENOIT FIORINA, CTR, Stanford University, Stanford, CA 94305, USA, SANJIVA K. LELE, Dept of Aero & Astro, Stanford University — A computational approach for modeling interactions between shocks waves, contact discontinuities and reactions zones with a high order compact scheme is investigated. To prevent the formation of spurious oscillations around shocks, artificial nonlinear viscosity [1], based on high-order derivative of the strain rate tensor is used. To capture temperature and species discontinuities a nonlinear diffusivity based on the entropy gradients is added. The damping of 'wiggles' is controlled by the model constants and is largely independent of the mesh size and the shock strength. The same holds for the numerical shock thickness and allows a determination of the L2 error. In the shock tube problem, with fluids of different initial entropy separated by the diaphragm, an artificial diffusivity is required to accurately capture the contact surface. Finally, the method is applied to a CJ detonation wave and to multi-dimensional flows including 2-D oblique wave reflection and a jet in a supersonic cross-flow.

[1] Cook & Cabot, J. Comput. Phys. 203 (2005)

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