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An Adaptive Wavelet Shock Capturing Scheme for Compressible Inert and Reactive Flows JONATHAN D. REGELE, OLEG V. VASILYEV, University of Colorado, Boulder — Most TVD schemes make use of artificial viscosity to reduce oscillations when solving hyperbolic conservation equations. In order to minimize the numerical dissipation introduced by artificial viscosity, high order TVD, WENO and MUSCL type schemes have been developed which require multistep finite volume calculations. Although there is a significant improvement in discontinuity steepness, it ultimately results in an increase of the overall computational cost of the numerical scheme. The current research seeks to develop a method that optimizes the computational cost by combining an inexpensive shock capturing viscosity scheme with the advantages that a dynamically adaptive wavelet-collocation method allows. A technique has been developed to reduce oscillations near a shock or discontinuity by explicitly adding localized dissipation terms in discontinuous regions while having zero dissipation elsewhere. In order to minimize the amount of dissipation introduced into the solution, which is especially important in reacting flows, the method only applies the viscosity proportional to the wavelet coefficients that are above a given threshold parameter. The main advantage of this technique is its generality and lack of dependence on the initial conditions as well as its simplicity and lower computational cost. Single and multi-dimensional demonstrations including inert and reactive flows are given and discussed.

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