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A modified artificial viscosity approach for compressible turbulence simulations[1] ANKIT BHAGATWALA, JOHAN LARSSON, SANJIVA LELE, Stanford University — Standard high-order methods give rise to spurious oscillations near shocks which can be controlled by using localized artificial viscosity (AV). Schemes which give a high wavenumber bias to the numerical dissipation around shocks are gaining popularity. Using simulations of compressible isotropic turbulence with optimized high-order schemes at different resolutions we investigated the range of scales where artificial dissipation is active. We observed that the impact of AV was not limited to high wavenumbers. This is especially true for moderately high Mach number isotropic turbulence which spontaneously forms shocklets, for which the AV method is found to excessively damp the dilatational motions. We propose a modified form using a dynamic coefficient which activates AV only in the regions of strong compression, such as shocks, turning it completely off for turbulence and expansion waves. This is found to give improved statistics for all quantities, not just dilatation. This formulation reverts back to the traditional one for strong shocks, so that its shock capturing capability is not compromised.

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Ankit Bhagatwala
ankitb@stanford.edu
Stanford University

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