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Direct Numerical Simulation of Compressible Turbulent Flows with Weighted Non-Linear Compact Schemes DEBOJYOTI GHOSH, SHIVAJI MEDIDA, JAMES BAEDER, University of Maryland — The numerical solution of compressible, turbulent flows requires a high-resolution, non-oscillatory algorithm to resolve a large range of length scales. Conventional non-linear flux limited schemes are too dissipative for length scales relevant to turbulent flow features, while compact interpolation schemes with high spectral resolution require monotonicity-preserving filtering for flows with discontinuities. The Compact Reconstruction WENO (CRWENO) scheme (*Ghosh and Baeder, SIAM J. Sci. Comput., 34(3), 2012*) uses a non-linear, solution-dependent combination of low-order compact interpolation schemes to yield a high-order accurate, non-oscillatory reconstruction scheme with high spectral resolution. Previous studies by the authors have demonstrated the improved performance of the CRWENO scheme at preserving and resolving smooth and discontinuous flow features (for one- and two-dimensional flow problems), compared to the WENO scheme of the same order of convergence. In the present study, the CRWENO scheme is applied to the direct numerical simulation of benchmark turbulent flow problems. In particular, the decay of isotropic turbulence and the shock-turbulence interactions are studied and the results are presented. The solutions from the CRWENO scheme are compared with those in the literature, obtained using WENO schemes and compact schemes with filtering.

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