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Local Stencil Adaption Properties of a WENO Scheme in Direct Numerical Simulations of Compressible Turbulence ELLEN M. TAYLOR, M. PINO MARTIN, Princeton University — Weighted essentially non-oscillatory (WENO) methods can simultaneously provide the high order of accuracy, high bandwidth-resolving efficiency, and shock-capturing capability required for the detailed simulation of compressible turbulence. However, rigorous analysis of the local error properties of these nonlinear numerical methods is difficult. We use a bandwidth-optimized WENO scheme to conduct direct numerical simulations (DNS) of two- and three-dimensional decaying isotropic turbulence, and we evaluate the performance of quantitative indicators of local WENO adaption behavior within the resulting flow fields. One aspect of this assessment is the demarcation of shock-containing and smooth regions where the WENO method should respectively engage its adaption mechanism and revert to its linear optimal stencil. Our results show that these indicators, when synthesized properly, can provide reliable and valuable quantitative information suitable for statistical characterization.

M. Pino Martin
Princeton University

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