COMPUTATIONAL METHODS FOR SHOCK-DRIVEN TURBULENCE AND LES OF THE RICHTMYER-MESHKOV INSTABILITY

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The development of numerical methods and subgrid-scale (SGS) models suitable for the large-eddy simulation (LES) of shock-driven turbulence will be described. The target problem is the strong-shock, Richtmyer-Meshkov instability in a rectangular tube, with endwall shock reflection and reshock of the evolving mixing layer. The requirements of numerical methods suitable for the LES of compressible turbulence generated by strong shocks, namely that they be shock capturing and that they also possess good modified wavenumber behavior in smooth flow regions away from shocks, will be discussed. A numerical method meeting these requirements based on a weighted essentially non-oscillatory (WENO) method matched to centered finite-difference stencils optimized for minimum resolved-scale error, will be presented. The use of a structure-based SGS model for LES of compressible turbulent flow will be described. Several LES applications will be presented including decaying compressible turbulence, turbulent mixing, and the Richtmyer-Meshkov instability.