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**Assessment of gradient-diffusion closures for modeling turbulent transport in three-dimensional Richtmyer-Meshkov instability-induced mixing with reshock** OLEG SCHILLING, University of California, Lawrence Livermore National Laboratory, MARCO LATINI, California Institute of Technology, WAI-SUN DON, Brown University — The turbulent transport properties of multimode Richtmyer- Meshkov instability with reshock are investigated using data from a three-dimensional, ninth-order weighted essentially non- oscillatory (WENO) simulation of the Mach 1.5 air/$SF_6$ Vetter- Sturtevant shock tube experiment. A spatial average over the periodic directions is used to define averaged and fluctuating quantities. Quantities needed in gradient-diffusion closure models, such as the turbulent viscosity, turbulent kinetic energy, and turbulent kinetic energy dissipation rate, are computed and used to model the unclosed terms in the turbulent kinetic energy and dissipation rate equations. These terms are then compared a priori to the analogous quantities obtained by directly averaging the data to assess the validity of the gradient-diffusion approximation. Implications for two-equation turbulence modeling of Richtmyer-Meshkov instability induced mixing with reshock are discussed. This work was performed under the auspices of the U.S. Department of Energy by the University of California Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48. This work was also supported by the Caltech ASC-Alliance Program. UCRL-ABS-214351.

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