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Turbulence Statistics in a Richtmyer-Meshkov Unstable Thin Fluid Layer after Reshock B.J. BALAKUMAR, GREG ORLICZ, DEVESH RANJAN, CHRIS TOMKINS, KATHY PRESTRIDGE, Los Alamos National Laboratory — We present true ensemble-averaged turbulence measurements of the density, velocity and density-velocity cross-statistics in a Richtmyer-Meshkov unstable varicose fluid layer after reshock. The instantaneous fields that comprise the ensemble at various times are obtained using high resolution simultaneous PIV-PLIF diagnostics employed on a repeatable fluid layer subjected to a Mach 1.2 shock and a subsequent reflected reshock. Sufficiently after reshock, the profiles of the density self-correlation show a double-peak structure, with the location of the peaks coinciding with the edges of the turbulent structure. The RMS of the fluctuating streamwise and spanwise velocities across the layer are observed to carry similar magnitudes pointing to a tendency of the flow to attain homogeneity. For the first time, experimentally measured density-velocity correlations will be presented to complete all the components of the 2D Reynolds stress tensor. Errors associated with the light propagation through the inhomogeneous turbulent medium, and the effects of different averaging procedures used in the calculation of the turbulence statistics will be evaluated to provide tight bounds on the present measurements. Finally, the connections of the various measurements to terms in the equations for the mass flux, kinetic energy and density self-correlation will be exemplified.

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