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Transition to turbulence in shock-accelerated flows without reshock M. LOMBARDINI, D.I. PULLIN, D.I. MEIRON, California Institute of Technology, R.A. GORE, Los Alamos National Laboratory — A numerical investigation of turbulence transition in shock-accelerated flow is described. Large-eddy simulations are performed for a heavy–light, SF_6–air ($A \simeq -0.67$) perturbed, density interface impacted by a shock wave of Mach number 1.5, 3.0 or 5.0. For these shock strengths, the initial perturbation amplitude is chosen such that the post-shock amplitude is about 25% of the initial perturbation dominant wavelength. The flow is computed in the frame of the unperturbed, post-shock interface and the LES uses periodic boundary conditions in the directions transverse to the main flow. This allows two isotropic directions within the mixing regime enabling calculation of instantaneous radial spectra. The spectra are obtained at the center-plane of the mixing zone at various times during the layer growth. Results indicate that the power spectra of the velocity components approach a $k^{-5/3}$ scaling, signaling a transition to turbulence accompanying a reorganization of the deposited kinetic energy. A spectral measure of the flow anisotropy shows a tendency to isotropy of the flow, although the axial-velocity power spectrum contains, at almost every scale, more than a third of the total kinetic energy. A budget of the plane-averaged, root-mean square vorticity accounts for the different sources of vorticity fluctuation and their evolution following the shock interaction.

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