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Experiments on the rarefaction wave driven Rayleigh-Taylor instability initiated with a random initial perturbation ROBERT MORGAN, JEFFREY JACOBS, The University of Arizona — Experiments are presented in which a diffuse interface between two gases is accelerated to become Rayleigh-Taylor unstable. The initially flat interface is generated by the opposing flow of two test gases at matched volumetric flow rates exiting through small holes in the test section. A random, three-dimensional interface perturbation is forced using a loudspeaker. The interface is then accelerated by an expansion wave which is generated by the rupturing of a diaphragm separating the heavy gas from a vacuum tank evacuated to ~ 0.01atm. The expansion wave generates a large (of order 1000 g), non-constant acceleration acting on the interface causing the Rayleigh-Taylor instability to develop. Planar Mie scattering is employed to visualize the flow using a planar laser sheet generated at the top of the apparatus, which illuminates smoke particles seeded in the heavy gas. The scattered light is then recorded using a CMOS camera operating at 12kHz. The mixing layer width is obtained from an ensemble of experiments and the turbulent growth parameter α is extracted and compared with previous experiments and simulations.

Robert Morgan
The University of Arizona

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