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Simultaneous Concentration and Velocity Field Measurements in a Shock-accelerated Mixing Layer[1] DANIEL REESE, JASON OAKLEY, University of Wisconsin-Madison, CHRIS WEBER, Lawrence Livermore National Laboratory, DAVID ROTHAMER, JOSE NAVARRO, RICCARDO BONAZZA, University of Wisconsin-Madison — The Richtmyer-Meshkov instability (RMI) is experimentally investigated at the Wisconsin Shock Tube Laboratory. Simultaneous concentration and velocity field measurements from the mixing layer of experimental RMI images are obtained through the application of the Advection-Corrected Correlation Image Velocimetry (ACCIV) technique. A statistically repeatable broadband initial condition is created by first setting up a gravitationally stable stagnation plane of helium+acetone over argon and then injecting the gases horizontally at the interface to create a shear layer. The shear layer is then accelerated by a Mach 2.2 planar shock wave that causes the growth of any perturbations present at the interface, and time-separated image pair data of the mixing layer are obtained using planar laser induced fluorescence (PLIF). The image pair is corrected to show relative acetone concentration, and is then used as input to the ACCIV algorithm to obtain velocity field results. These velocity field measurements are compared with those obtained from numerical simulations. Turbulent kinetic energy spectra are compared with particle imaging velocimetry (PIV) and simulation results to validate regions of applicability.

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