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Emergence of power-law scalings in shock-driven mixing transition[1] PETER VOROBIEFF, PATRICK WAYNE, DELL OLMSTEAD, DYLAN SIMONS, C. RANDALL TRUMAN, University of New Mexico, SANJAY KUMAR, Indian Institute of Technology - Kanpur — We present an experimental study of transition to turbulence due to shock-driven instability evolving on an initially cylindrical, diffuse density interface between air and a mixture of sulfur hexafluoride (SF_6) and acetone. The plane of the shock is at an initial angle θ with the axis of the heavy-gas cylinder. We present the cases of planar normal ($\theta = 0$) and oblique ($\theta = 20°$) shock interaction with the initial conditions. Flow is visualized in two perpendicular planes with planar laser-induced fluorescence (PLIF) triggered in acetone with a pulsed ultraviolet laser. Statistics of the flow are characterized in terms of the second-order structure function of the PLIF intensity. As instabilities in the flow evolve, the structure functions begin to develop power-law scalings, at late times manifesting over a range of scales spanning more than two orders of magnitude. We discuss the effects of the initial conditions on the emergence of these scalings, comparing the fully three-dimensional case (oblique shock interaction) with the quasi-two-dimensional case (planar normal shock interaction). We also discuss the flow anisotropy apparent in statistical differences in data from the two visualization planes.

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Peter Vorobieff
University of New Mexico

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