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Integrated study of non-uniform structures in Richtmyer-Meshkov unstable flows by means of theoretical analysis, Lagrangian and Eulerian numerical simulations, and experiments[1] J.T. CASSIBRY, M. STANIC, University of Alabama, Huntsville, AL, USA, R.F. STELLINGVERF, Stellingverf Consulting, Huntsville, AL, USA, J. MCFARLAND, D. RANJAN, University of Texas A&M, TX, USA, R. BONAZZA, University of Wisconsin, Madison, WI, USA, S.I. ABARZHI, University of Chicago, Chicago, IL, USA — We conducted the integrated study of the Richtmyer-Meshkov flow by means of theoretical analysis, Lagrangian and Eulerian numerical simulations, and experiments achieving good qualitative and quantitative agreement. In our study, Mach numbers are moderate, Atwood numbers are high, initial perturbation amplitudes are finite, and the initial perturbation is coherent. We showed that in this regime, the velocity at which the interface would move if it would be ideally planar is a relevant parameter, as it tracks the amount of momentum and energy deposited by shock at the interface. The amplitude of the initial perturbation is one of key factors of RMI evolution. In case of large amplitudes, the vector and scalar fields in the fluid bulk are non-uniform. The flow non-uniformities include cumulative reverse jets, checkerboards velocity pattern, shock-focusing effects, and local hot spots with temperature substantially higher than that in the ambient. The dynamics of the nonlinear flow is shown to have an essentially multi-scale character.

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Snezhana I. Abarzhi
University of Chicago, IL

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