Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Dimensional crossover in Richtmyer-Meshkov unstable flows in the presence of pressure fluctuations[1] AKLANT K. BHOWMICK, SNEZHANA ABARZHI, Carnegie Mellon University — We analyze Richtmyer-Meshkov unstable interfacial dynamics in the presence of pressure fluctuations. The pressure fluctuations are scale invariant and are modeled by an effective time dependent acceleration field with power law exponent -2. The group theory based analysis is applied to 3D rectangular p2mm, 3D square p4mm and 2D pm1 RM flows. From the symmetry analysis, we find that 3D square and 2D bubbles form a one parameter family and 3D rectangular bubbles form a two parameter family. The families are parametrized by the principal curvature(s). The bubble velocity and Fourier amplitude profiles exhibit RM type behavior for weak accelerations and RT type behavior for strong accelerations. Under the dimensional crossover, the bubbles elongated in one of the directions reduce to the 2D solutions, whereas the bubbles elongated in the other direction flatten. Stability analysis shows that 3D square bubbles are stable with respect to isotropic as well as anisotropic perturbations. 2D bubbles are unstable to 3D perturbations. No continuous transition is possible between 3D square and 2D bubbles and the dimensional crossover is discontinuous for both strong and weak pressure fluctuations.

Snezhana Abarzhi
Carnegie Mellon University

Date submitted: 16 Jul 2016   Electronic form version 1.4