Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Dimensional crossover in Rayleigh Taylor flows driven by time dependent accelerations[1] AKLANT K. BHOWMICK, SNEZHANA ABARZHI, Carnegie Mellon University — We investigate the nature of dimensional crossover i.e. transition between the nearly isotropic 3D square bubbflows les to highly anisotropic 2D flows in Rayleigh Taylor (RT) instability. Power law time dependence of the acceleration is considered with the emphasis on sub-regime, where the behavior is RT type. We consider flow with rectangular symmetry and obtain the 3D square and 2D limits with leading order rectangular corrections. Solutions evolve as power law and solutions form a two parameter family parametrized by the principal curvatures of the bubble. The bubbles with near circular contour separate the 2-dimensional solution space into two distinct regimes having distinct properties under the dimensional crossover. In one regime, the elongated bubbles transform to 2D solutions, whereas in the other the elongated bubbles flatten under a dimensional crossover. 3D square bubbles are universally stable whereas 2D bubbles are unstable with respect to 3D modulations, implying that the dimensional crossover is discontinuous. The time dependence affects the growth/decay of perturbations and has no consequence on the overall stability properties of the solution.

[1]The work is supported by the US National Science Foundation

Snezhana Abarzhi
Carnegie Mellon University

Date submitted: 21 Jul 2016 Electronic form version 1.4