Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Rayleigh-Taylor mixing in supernova experiments[1] NORA SWISHER, Carnegie Mellon University, CAROLYN KURANZ, University of Michigan at Ann Arbor, DAVID ARNETT, University of Arizona, OMAR HURRICANE, BRUCE REMINGTON, HARRY ROBEY, Lawrence Livermore National Laboratory, SNEZHANA ABARZHI, Carnegie Mellon University — We report a scrupulous analysis of data in supernova experiments that are conducted at high power laser facilities in order to study core-collapse supernova SN1987A. Parameters of the experimental system are properly scaled to investigate the interaction of a blast-wave with helium-hydrogen interface, and the induced Rayleigh-Taylor (RT) mixing of the denser and lighter fluids with time-dependent acceleration. We analyze all available experimental images of RT flow in supernova experiments, and measure delicate features of the interfacial dynamics. A new scaling is identified for calibration of experimental data to enable their accurate analysis and comparisons. By proper accounting for the imprint of the experimental conditions, the data set size and statistics are substantially increased. New theoretical solutions are identified to describe asymptotic dynamics of RT flow with time-dependent acceleration by applying theoretical analysis. Good qualitative and quantitative agreement is achieved of the experimental data with the theory and simulations. Our study indicates that in supernova experiments, the RT flow is in the mixing regime, the interface amplitude contributes substantially to the characteristic length scale for energy dissipation; the mixing flow may keep order.

[1]Support of the National Science Foundation is warmly appreciated

Snezhana Abarzhi
Carnegie Mellon University

Date submitted: 14 Jul 2015 Electronic form version 1.4