Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Blast-Driven Hydrodynamic Instability[1] MARC T. HENRY DE FRAHAN, ERIC JOHNSEN, University of Michigan — Accurate characterization of mixing from hydrodynamic instabilities, such as Richtmyer-Meshkov, Rayleigh-Taylor, and Kelvin-Helmholtz, is important to many multi-fluid applications, particularly, inertial confinement fusion, supernova collapse, and scramjet combustion. We investigate the dynamics of a perturbed interface between two fluids subjected to a planar blast wave. An initial point source explosion initiates a blast, which can be described as a shock front followed by a rarefaction wave. The interface, therefore, experiences an instantaneous acceleration (a pressure increase) followed by a gradual, time-dependent deceleration (a pressure decrease). The resulting interaction gives rise to Richtmyer-Meshkov and Rayleigh-Taylor growth, depending on the shock strength and blast profile. Using a high-order accurate numerical method that prevents pressure errors at interfaces when simulating variable specific heats ratios, we identify regimes in which one or the other instability dominates.

[1]This research was supported by the DOE NNSA/ASC under the predictive Science Academic Alliance Program by Grant No. DEFC52-08NA28616.

Marc T. Henry de Frahan
University of Michigan

Date submitted: 01 Aug 2013 Electronic form version 1.4