Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Experiments on Effects of Initial Conditions and Material Strength on Rayleigh-Taylor Instability[1] PAMELA ROACH, Missouri S&T, ARINDAM BANERJEE, Lehigh University — The effects of initial conditions on Rayleigh-Taylor (RT) instability in an accelerated elastic-plastic solid were studied. A novel rotating wheel RT experiment that uses centrifugal forces to accelerate a two-material interface was utilized to study the effect of amplitude and wavelength on RT instability with an elastic-plastic solid. The experiment consists of a container filled with air and mayonnaise, a non-Newtonian emulsion, with an initial perturbation between the two materials. Single mode perturbations of various amplitudes and wavelengths were analyzed and results indicated the acceleration required for instability increased for both decreasing initial amplitude and wavelength. Three-dimensional interfaces were found to be more stable than two-dimensional interfaces. Critical amplitude and growth rates were compared with prior experimental results and analytical growth models. Elastic and plastic peak amplitude responses were observed for stable interfaces using a variable acceleration profile where the test section was first accelerated to slightly below the critical acceleration and then decelerated at the same rate. This exercise allowed for verification of the elastic-plastic (EP) transition process before instability was reached.

[1]Authors acknowledge financial support from DOE-LANL subcontract # 173667-1 to Lehigh University and a NSF-Graduate Research Fellowship to Pamela Roach.

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Date submitted: 31 Jul 2013 Electronic form version 1.4