Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Experimental study of the Rayleigh-Taylor instability initiated with a complex, short-wavelength initial perturbation. DAVID OLSON, JEFFREY JACOBS, University of Arizona — Experiments exploring the Rayleigh-Taylor (RT) instability initiated with a short-wavelength near single-mode initial perturbation have been performed. The experiments were conducted using a square Plexiglass tank mounted to a vertical rail system. The tank is filled with a stably stratified combination of two miscible liquids having an Atwood number of approximately 0.15. The instability is initiated with an imposed initial perturbation in the form of internal Faraday waves at the interface of the two fluids. RT instability is then generated by accelerating the tank down the rails through a pulley-weight system. Net accelerations ranging from 0.4 to 1.4 g's are achieved. The Faraday waves are created by oscillating the tank vertically. The current configuration is capable of creating Faraday waves with a three-dimensional nearly single-mode pattern with wavelengths ranging from 7 to 10 mm. PLIF images of the instability developing from these perturbations reveal what appears to be the beginnings of the development of a turbulent self-similar flow.

Jeffrey Jacobs
University of Arizona

Date submitted: 09 Aug 2005 Electronic form version 1.4