Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

On Initial Conditions for Turbulent Rayleigh-Taylor Mixing
BERTRAND ROLLIN, MALCOLM J. ANDREWS, Los Alamos National Laboratory — Rayleigh-Taylor (RT) instability occurs when the pressure gradient opposes the density gradient at a perturbed interface between two media. For fluids, the instability causes mixing which, in time, turns turbulent. This fundamental instability is observed in natural phenomena such as salt dome formation, or supernovae explosions, and in engineering applications such as heat exchangers and sprays in internal combustor, or in the implosion phase of Inertial Confinement Fusion (ICF). Non negligible effects of initial conditions (ICs) on the development and turbulent mixing of the Rayleigh-Taylor instability, create an opportunity for prediction and "design" of RT turbulence for engineering purposes. Most turbulence models used for studying engineering applications are defined for fully developed turbulence, and therefore do not account for initial conditions effects. Our research seeks a rational methodology to provide initial conditions in variable density turbulence models. We report our methodology for following the evolution of the mixing layer based on the composition of the initial perturbation spectrum, and extracting profiles of relevant variables for the turbulence model. Metrics defining the time at which the turbulence model should relay our model, and when ICs-induced anomaly(s) will occur in late time turbulent mixing will also be discussed. Handling of late time anomaly in the turbulence model will be suggested.

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Date submitted: 04 Aug 2010 Electronic form version 1.4