Poster 1 Ramaprabhu & Andrews

An overview of Rayleigh-Taylor experiments at Texas A&M University

Praveen Ramaprabhu[1] & Malcolm J. Andrews[2]

[1]Los Alamos National Laboratory
Los Alamos, New Mexico, USA
ramaprabhu@cnls.lanl.gov

[2]Department of Mechanical Engineering
Texas A&M University, College Station, Texas, USA
mandrews@mengr.tamu.edu

We present a summary of results obtained from the small Atwood number ($A_t \sim 7.5 \times 10^{-4}$) Rayleigh-Taylor (RT) experimental facility at Texas A&M University over the past 10 years. The conditions for RT instability are created by admitting cold water over a stream of hot water in a water channel facility. A splitter plate initially separates the two streams. As the fluid streams leave the edge of the splitter plate, an unstable interface is formed that results in a RT mix. The experiment allows for long data collection times, short transients, and is statistically steady. Over the past 10 years a variety of quantitative and qualitative flow measurement methods have been used or developed. In particular, velocity and density measurements have been made using the Particle Image Velocimetry technique, and high-resolution thermocouples respectively. In addition, a novel technique to simultaneously measure velocity-density fields was developed. The results to be presented include mean density profiles through the mix, and up to two decades of velocity spectra development, and four decades of temperature spectra. Consistent with the statistics, the velocity spectra also exhibit anisotropy between the vertical and horizontal velocity fluctuations, and a more isotropic dissipative range. The net kinetic energy dissipation, as the flow evolves from an initial state to a final self-similar state, was measured to be 49% of the accompanying loss in potential energy, and is in close agreement with values obtained from 3D numerical simulations. We will close with a description of a new high Atwood number RT mix experiment currently under development.