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Large Atwood number, miscible-liquid experiments and simulations on the Rayleigh-Taylor instability MICHAEL ROBERTS, JEFFREY JACOBS, University of Arizona, WILLIAM CABOT, Lawrence Livermore National Laboratory — Experiments and numerical simulations are presented in which an incompressible system of two miscible liquids is accelerated to produce the Rayleigh-Taylor instability. In the experiment, the initially stable, stratified liquid combination is accelerated on a vertical rail system. Either a rectangular or square plexiglass tank, which encloses the liquids, is affixed to a test sled on the rail system. The test sled is then pulled downward, using a system of weights and pulleys, at a rate greater than that of gravity. This produces the upward body force that drives the instability. The resulting fluid flows are visualized with backlit imaging using an LED backlight in conjunction with a monochrome high-speed video camera, both of which are affixed to the test sled. Initial perturbations are either unforced and allowed to progress from thermal background noise or forced by vertically oscillating the liquid combination to produce Faraday internal waves. The results from both of these experimental setups are compared to numerical simulations performed using the CFD code Miranda. Good agreement between the experiment and the simulation is obtained.

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