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Understanding the impact of initial condition on low Atwood number Rayleigh-Taylor driven flows SARAT CHANDRA KUCHIBHATLA, DEVESH RANJAN, Texas A&M University — Experimental investigation of the effects of initial conditions on Rayleigh-Taylor instability was performed using the Water Channel facility at Texas A&M University. Hot and cold water (with a temperature difference of ∼7-8 degrees C) selected as working fluids were unstably stratified using a splitter plate resulting in a low Atwood number of ∼0.0015. Using a servo controlled flapper system the effect of initial conditions is studied using different diagnostics such as optical imaging, thermocouples and hot-wire anemometry. A parametric study comprising of up to 10 modes of the initial condition was performed by varying the number of modes as well as modal composition (*i.e.* ratio of wavenumbers and phase differences). Variation of density, temperature and velocity field in the linear and non-linear stages of RT growth was recorded and analyzed. At non-dimensional time, $t^* = t(A_t g/\mathrm{H})^{0.5} = 1.3$, where t is the time, H is the width of the Channel, and g is the acceleration due to gravity, power spectra of the non-dimensional density showed fine-scale components that are dependent upon the initial condition. Plots of scalar dissipation and mixing rate indicate greater dissipation rate at early times that tends to asymptote to the order of kinematic viscosity at late times.

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