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Imaging Improvement of Miscible Experiments on the Rayleigh-Taylor Instability in the Linear Induction Motor Drop Tower CLAYTON WITHERS, JEFFREY JACOBS, University of Arizona — Incompressible miscible experiments on the Rayleigh-Taylor Instability (RTI) using Planar Laser Induced Fluorescence (PLIF) on a Linear Induction Motor Drop Tower are presented. The vertical tower guides a test sled that is accelerated using linear induction motors. Experimental fluid pairs are prepared and placed into a test chamber attached to the sled. The sled is accelerated downward at a rate of approximately 15g. Upon acceleration, the stratified initially stable fluid pair within the chamber becomes unstable allowing the RTI to develop. The resulting RTI is imaged using PLIF by seeding the heavier fluid with fluorescein dye that is illuminated by a scanning 445nm laser beam. The indices of refraction (IOR) for the two fluids are initially matched before experimental runs, however, mixing of the fluids causes variation of IOR. Variation of IOR within the fluids causes laser beam wander, negatively impacting PLIF imaging, and resulting in image blurriness. Modeling IOR as a nonlinear fluid property is performed. Variation of IOR is minimized using this model, allowing preparation of optimized fluid pairs that reduce image blurriness. Resulting images and information on RTI growth are presented.

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