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PLIF flow visualization of magnetically stabilized Rayleigh-Taylor instability. OMID GOHARDANI, REBECCA OEMKE, JEFFREY W. JACOBS, University of Arizona — Experiments are presented that utilize the properties of paramagnetic fluids to study Rayleigh-Taylor instability. The fluids, a miscible combination of a paramagnetic salt solution and another nonmagnetic liquid, are contained in a tank placed between the poles of a large electromagnet. The suspension of the heavy paramagnetic fluid over the lighter non-magnetic fluid is attained by the gradient field principle. Rayleigh-Taylor instability is initiated by switching off the current to the electromagnet, which results in the heavy fluid falling due to gravity. The resulting instability is visualized using planar laser-induced fluorescence (PLIF). Results will be presented for experiments initiated with either a nominally flat interface or a curved interface generated by the applied magnetic field. The experiments initiated with a flat initial interface develop a random surface pattern with dominant length scale well approximated by the fastest growing wavelength given by viscous linear stability theory. Experiments initiated with a curved interface develop similar to the single-mode instability.

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