Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Richtmyer-Meshkov instability experiments of miscible and immiscible incompressible fluids. VITALIY KRIVETS, BRASON HOLT, MATTHEW MOKLER, JEFFREY JACOBS, University of Arizona — Experiments were conducted in a 3 m tall vertical drop tower setup. A flat interface separating two liquids of differing density is formed in the Plexiglas tank with the heavier fluid in the bottom and the lighter one on top. Two liquids pairs were utilized, one - miscible (isopropyl alcohol and a calcium nitrate water mixture) and the other immiscible (silicone oil with the same heavy liquid), both with Atwood near 0.2. The tank is mounted on a rail mounted sled at 2 m initial height where an initial perturbation is generated using vertical periodic motion with 10 Hz frequency and 1 mm displacement, thus producing 3D interfacial waves. An impulsive acceleration, with approximately 100g magnitude, is imparted to the sled by a rail mounted weight released and allowed to fall, impacting the sled from above. Both weight and sled then travel freely down the rails where they are smoothly decelerated at the bottom of drop tower by magnetic brakes. PLIF is used to visualize mixing process by seeding fluorescein in the bottom fluid and illuminating using laser diode from above forming thin vertical sheet. The resulting fluorescent image sequences are captured using a digital camera mounted to the sled operating at a 100 Hz framing rate. Comparisons of the measured growth of the mixing zone for both immiscible and miscible liquid combinations with theoretical models are presented.

Vitaliy Krivets
University of Arizona

Date submitted: 31 Jul 2017 Electronic form version 1.4