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Air entrainment by 2D plunging jets[1] NICOLE FARIAS, SIMO A. MKIHARJU , UC Berkeley — Air entrainment from liquid plunging jets are commonly found in nature and industry applications. As a result, this phenomenon has been the focus of many studies in the past, which showed it to have a significant contribution to the energy and mass transfer between gas and liquids. Air entrapment was also discovered to be a function of various parameters, such as jet impact velocity, geometry, fluid properties, and resulting jet instabilities. Due to the complex multiphase flow involved, no exhaustive characterization or theory is yet available, and limited data has been published on the dynamics within the entrainment zone once entrainment becomes significant enough to make the flow optically opaque. We study 2D plunging jets using high-speed video, point probes and O(10kHz) 2D X-ray densitometry to examine the air entrainment and nominally 2D flow structures, while varying jet size, speed, height and angle, and fluid properties such as surface tension and viscosity. We span Reynolds numbers from 7 to 25 x10^3, and Weber numbers from 0.3 to 40.4. The high-speed x-ray densitometry we employ enables time-resolved analysis of phase fraction in large areas with greater efficiency and detail than feasible utilizing point probes alone.

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