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Rayleigh-Taylor Instability in Drop Impact Experiments VICTOR LHERM, Ecole Normale Superieure de Lyon, RENAUD DEGUEN, Universite Grenoble Alpes, THIERRY ALBOUSSIRE, Universite Claude Bernard Lyon 1, MAYLIS LANDEAU, Institut de Physique du Globe de Paris — When a liquid drop strikes a deep pool of a second liquid, an impact crater opens while the drop liquid decelerates and spreads on the surface of the crater. If the density of the drop is larger than the surrounding, we find that the drop-pool interface becomes unstable, producing mushroom-shaped plumes growing radially outward. We interpret this instability as a Rayleigh-Taylor instability associated with the approximately radial deceleration of the drop-pool interface. We investigate experimentally how changing the density contrast and the Froude number affect the instability and the growth of the resulting mixing layer. Using backlighting and Planar Laser-Induced Fluorescence methods, the position of the air-liquid interface, the mixing layer thickness and the instability wavelength are obtained. An energy conservation model for the mean crater radius is derived and compared with the experiments. Then, the mixing layer dynamics is explained by a model initially governed by the geometrical expansion of the crater, and then by the density-driven instability between the drop and the pool. Finally, the measured instability wavelength is compared with an approximate linear stability analysis of a spherical, viscous, and radially accelerated fluid sphere into a less dense fluid.

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