

Drop Fingering on Oblique Impact: Part 1—Experimental Data

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Abstract

Compared with other variations of drop impacts, the oblique impact has received comparatively little attention. Most experimental work detailed in the literature has focused on the perpendicular impact while subsequently varying other parameters. Indeed, it has been theorized that an oblique impact behaves much like a perpendicular impact except with the perpendicular component of the velocity being applicable to the behavior. But an oblique splashing drop preferentially splashes in the direction of travel (component parallel to the surface). Very little information exists to help describe how angled drop impacts differ from the perpendicular impacts. Motivation to better understand large-scale impacts has led to increased concern regarding these phenomena. Resources have been invested in experiments and modeling efforts to better describe the oblique splash problem.

Experiments spanned a range of conditions that involve between 0.2 and 10 cm diameter drops, velocities ranging from about 1 to 20 m/s, and impact angles from 90° to 45° (from horizontal). Data were recorded with high speed video for velocities of the spreading edge and splash at all locations around the circumference of the impact region. In addition, instability conditions were also evaluated. A significant database has been compiled that includes all relevant test parameters and measurements for each case. This work provides important new insight in which models can be developed for predicting impact, spreading and splash for angled impact.

Key words: Impact angle, instabilities, fingers, pressure, droplet

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