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Impact of a viscous drop WENDY W. ZHANG, ROBERT D. SCHROLL, University of Chicago, CHRISTOPHE JOSSERAND, STEPHANE ZALESKI, UMR 7190, Institut d'Alembert — Recent experiments [1] reveal that reducing the ambient air pressure entirely suppresses the splash generated by the impact of an oil drop at several m/s onto a dry smooth wall. Motivated by these observations, we simulate two types of drop impact: impact onto a smooth, dry solid wall and head-on collision of two identical liquid drops. In both cases we make the additional simplification that impact simply arrests the downward fall and redirects the liquid radially outwards in a thin, expanding sheet. It does not break the drop surface. Since experiments suggest that splash is created by airflow deforming the thin sheet, we focus on the time-evolution of the thin liquid sheet but restrict ourselves to the simpler situation of negligible airflow effects. In this regime, we find that the ejected sheet is always characterized by two different lengthscales. Surface tension controls the rim size. The thickness over the rest of the sheet is controlled by a different mechanism. Impact onto a solid surface creates a pancake whose thickness is controlled by viscous dissipation. Head-on collision creates a sheet that thins continuously with distance from the collision center. Its thickness is controlled by the kinematics of impact.
[1] Stevens, Keim, Zhang & Nagel, FC03 APS DFD meeting (2007)

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