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Experiments on the breakup of drop-impact crowns by Marangoni holes ABDULRAHMAN ALJEDAANI, ADITYA JETLY, CHUN-LIANG WANG, SIGURDUR THORODDSEN, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia — We investigate experimentally the breakup of the Edgerton crown due to Marangoni instability when a highly viscous drop impacts on a thin film of lower-viscosity liquid, which also has different surface tension than the drop liquid. The presence of this low-viscosity film modifies the boundary condition, giving effective slip to the drop along the solid substrate. This allows the drop to form a regular bowl-shaped crown, which rises vertically away from the solid and subsequently breaks up through the formation of a multitude of Marangoni holes. Previous experiments have proposed that the breakup of the crown results from a spray of fine droplets ejected from the thin film These droplets can hit the inner side of the crown forming spots with lower surface tension, which drive the hole formation. We test the validity of this assumption with close-up imaging to identify individual spray droplets, to show how they hit the crown and their lower surface tension drive the hole formation. Surprisingly, in experiments with pools of higher surface tension, we also see hole formation.

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