Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Singular jets from the collapse of craters at a pool surface[1]
YUANSI TIAN, SIGURDUR THORODDSEN, KAUST — The collapse of drop-impact craters can generate a fast singular jet from a dimple which forms at its bottom. A finite-time singularity in the bottom curvature of the crater has in the past been considered as the cause of this singular jet. Self-similar capillary-inertial solutions predict that the radius of the cavity will collapse with time, as R to t of the power 2/3. However, Thoroddsen et al.[1] used a high-speed camera to demonstrate that the final collapse has a power-law closer to a purely inertial collapse, with R to t of the power 1/2. They also observed no curvature singularity. Herein, we use two synchronized high-speed cameras to study the dimple collapse, at even higher time resolution. One is an ultra-fast camera, capable of up to 5 Mfps, which tracks the crater collapse. The second high-speed camera captures the corresponding speed of the singular jet, at up to 400 kfps. The experiment is performed inside a vacuum chamber to control the ambient pressure. The fastest velocity of singular jets is found to be around 130 m/s and occurs at reduced pressure without crater pinch-off. REFERENCES: 1. Thoroddsen S. T., Takehara K., Nguyen H. D. and Etoh T. G. 'Singular jets during the collapse of drop-impact craters', Journal of Fluid Mechanics, 2018, 848, R3.

[1]KAUST Grant No. URF/1/2621-01-01

Yuansi Tian
KAUST

Date submitted: 29 Jul 2019 Electronic form version 1.4