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Dynamics of yield-stress droplets: Morphology of impact craters
JEROME NEUFELD, DAVID SOHR, LEO FERRARI, STUART DALZIEL, University of Cambridge — Yield strength can play an important role for the dynamics of droplets impacting on surfaces, whether at the industrial or planetary scale, and can capture a zoo of impact crater morphologies, from simple parabolic craters, to more complex forms with forms with, for example, multiple rings, central peaks. Here we show that the morphology of planetary impact craters can be reproduced in the laboratory using carbopol, a transparent yield-stress fluid, as both impactor and bulk fluid. Using high-speed video photography, we characterise the universal, transient initial excavation stage of impact and show the dependence of the subsequent relaxation to final crater morphology on impactor size, impact speed and yield stress. To further interrogate our laboratory impacts, we dye our impactor to map its final distribution and use particle tracking to determine the flow fields during impact and the maximal extent of the yield surface. We characterise the flow-fields induced during impact, and the maximal extent of the yield surface, by tracking particles within the bulk fluid and map the distribution of impactor and bulk by tracing the final distribution of dyed impactor. The results of laboratory impact droplets are used to infer the properties of planetary impactors, and aid in inter

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