Abstract Submitted
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Impact cratering on granular beds: From the impact of raindrops to the strike of hailstones[1] LEONARDO GORDILLO, JUNPING WANG, FRED JAPARDI, WARREN TEDDY, MING GAO, XIANG CHENG, CEMS - University of Minnesota — Impact craters generated by the impact of a spherical object onto a granular bed strongly depend on the material properties of impactors. As an example, impact cratering by liquid drops and by solid spheres exhibits qualitatively different power-law scalings for the size of resulting impact craters. While the basic energy conservation and dimensional analysis provide simple guiding rules, the detailed dynamics governing the relation between these power-law scalings is still far from clear. To analyze the transition between liquid-drop and solid-sphere impact cratering, we investigate impact cratering by liquid drops for a wide range of viscosities over 7 decades. Using high-speed photography and laser profilometry, we delineate the liquid-to-solid transition and show the emergence of the two asymptotic behaviors and their respective power laws. We find that granular avalanches triggered by impacts are crucial in understanding the energy partition between impacted surfaces and impactors, which directly determines the observed scaling relations. A simple model is constructed for the initial stage of the impact that explains the energy partition during crater formation.

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