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Waterbowls: Reducing Impacting Droplet Interactions by Momentum Redirection HENRI-LOUIS GIRARD, DAN SOTO, KRIPA VARANASI, MIT — Droplets impacting a solid surface can transfer mass and energy to that substrate. While superhydrophobic surfaces can restrict this transport by making drops bounce off, the liquid-solid contact is still extensive. Recent studies aiming to limit this transport further have focused on reducing the contact time. Here, we remark that flux-based transport phenomena scale with the contact area as well as time leading us to define an Interaction Parameter as the integral of the contact area as a function of time to describe the drop-substrate interaction. We design superhydrophobic surfaces with a macroscopic structure that redirects the momentum of the spreading lamella upwards, thereby restricting the liquid-solid contact. We show that, when optimally designed, such surfaces can reduce the interaction parameter by an order of magnitude compared to a regular superhydrophobic surface and provide design guidelines for the macroscopic structure. Finally, we demonstrate that a well-designed surface can reduce heat transfer between a simulated rain and a solid surface by a factor of two.

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