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Air cushioning in drop impact JOLET DE RUITER, JUNG OH, DIRK VAN DEN ENDE, FRIEDER MUGELE, University of Twente — Liquid drops impacting on solid surfaces deform under the influence of the ambient gas that needs to be squeezed out before a true solid-liquid contact can be established. We demonstrate experimentally the existence of this theoretically predicted air layer and follow its evolution with time for moderate impact speeds ($We \sim 1 \ldots\ 10$) using reflection interference microscopy with a thickness resolution of approximately 10nm. For a wide range of fluid properties (ρ, γ, η) we find a very robust generic behavior that includes the predicted formation of a dimple in the center of the drop with a local minimum of the air film thickness at its boundary. Depending on We as well as the fluid properties, a skating layer of more or less constant thickness as well as a second local minimum of the air film thickness farther away from the drop center develop in time. Eventually, solid-liquid contact is generated via random nucleation event. The nucleation spot spreads across the drop-substrate interface within a few milliseconds. This process can lead to the entrapment of an air bubble.

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