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Impact force of a liquid drop containing a bubble

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Air-in-liquid compound drops can be used to produce foam materials or for the fabrication of Thermal Barrier Coatings. The impact of these compound drops can finally leave an encapsulated bubble onto the target surface, or a thin liquid film, depending the eventual bursting of the bubble. The presence of the bubble in the drop affects the impact dynamics, leading to the formation of a counter jet, or reducing its maximal spreading diameter.

We focus here on the early impact dynamics of an air-in-liquid compound drop onto a solid surface. We perform axisymmetric simulations of the impact with the open source code Basilisk. We first reproduce the capillary and inertial regimes of the impact of a full drop. We then demonstrate that the impact force decreases with the increase of the bubble size. This decrease can be explained by a scaling argument on the impact force, mainly due to a reduction of the impact area over which high pressures are generated during impact.

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