Abstract Submitted
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Shock-induced atomization of water droplets[1] BENEDIKT DORSCHNER, KEVIN SCHMIDMAYER, California Institute of Technology, LUC BIASIORI, HAZEM EL-RABII, Institut Pprime (CNRS), TIM COLONIUS, California Institute of Technology — Aerobreakup of droplets occurs when liquid drops are suddenly exposed to high-speed gas flows, which leads to their deformation and eventually their breakup, i.e., atomization. This phenomenon is of crucial importance for applications such as bulk dissemination of liquid agents, raindrop damage during supersonic flight as well as secondary atomization of liquid jets in turbomachinery. Depending on the Weber number (ratio of inertia and capillary forces), various breakup mechanisms and regimes ranging from vibrational to catastrophic breakup can be identified. Of particular interest is the stripping regime, which marks a transition to fundamentally different breakup mechanisms and will be subject of this contribution. Three-dimensional high fidelity simulations are used to study the breakup mechanisms and instabilities in detail for various Weber numbers. By properly accounting for surface tension forces, we elucidate the role of capillary effects such Rayleigh-Plateau instabilities, which may become important due to the large range of scales in the course of the breakup. Numerical findings are underlined by accompanied experiments using high-magnification shadowgraphy.

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