Abstract Submitted
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A mesoscale analysis of the Rayleigh-Plateau instability[1] MARCO ARIENTI, LI XIAOYI, MARIOS SOTERIOU, UTRC, WENXIAO PAN, GEORGE KARNIADAKIS, Brown U. — Capillary pinch-off results carried out with the Many-Body Dissipative Particle Dynamics (MDPD) method are compared with the two-phase continuum discretization of hydrodynamics. The MDPD method provides a mesoscale description of the liquid-gas interface – molecules can be thought of as grouped in particles with modeled Brownian and dissipative effects. No liquid-gas interface is explicitly defined; surface properties, such as surface tension, result from the MDPD interaction parameters. In side-to-side comparisons, the behavior of the MDPD liquid is demonstrated to replicate the macroscale behavior (thin interface assumption) calculated by the Combined Level Set-Volume of Fluid (CLSVOF) method. For instance, in both the continuum and mesoscale discretizations the most unstable wavelength perturbation leads to pinch-off, whereas a smaller wavelength-to-diameter ratio, as expected, does not. The behavior of the virial pressure in MDPD will be discussed in relation to the hydrodynamic capillary pressure that results from the thin interface assumption.

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