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**Interfacial Instabilities on a Droplet** MAZIYAR JALAAL, Department of Mechanical Engineering, The University of British Columbia, Vancouver, BC, Canada, KIAN MEHRAVARAN, School of Engineering, The University of British Columbia, Kelowna, BC, Canada — The fragmentation of droplets is an essential stage of several natural and industrial applications such as fuel atomization and rain phenomena. In spite of its relatively long history, the mechanism of fragmentation is not clear yet. This is mainly due to small length and time scales as well as the non-linearity of the process. In the present study, two and three-dimensional numerical simulations have been performed to understand the early stages of the fragmentation of an initially spherical droplet. Simulations are performed for high Reynolds and a range of relatively high Weber numbers (shear breakup). To resolve the small-scale instabilities generated over the droplet, a second-order adaptive finite volume/volume of fluids (FV/VOF) method is employed, where the grid resolution is increased with the curvature of the gas-liquid interface as well as the vorticity magnitude. The study is focused on the onset and growth of interfacial instabilities. The role of Kelvin-Helmholtz instability (in surface wave formation) and Rayleigh-Taylor instability (in azimuthal transverse modulation) are shown and the obtained results are compared with the linear instability theories for zero and non-zero vorticity layers. Moreover, the analogy between the fragmentation of a single drop and a co-axial liquid jet is discussed. The current results can be used for the further development of the current secondary atomization models.

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