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Asymmetric primary breakup of a round liquid jet with non-zero injection angle BO ZHANG, YUE LING, Baylor University — In previous simulations of liquid jet atomization, the injection velocity is generally considered to be aligned with the nozzle axis. As a result, the near-field instability development is axisymmetric. Nevertheless, in many fuel injection applications, the liquid flow direction at the nozzle inlet is not perpendicular to the inlet plane. The effect of the angle between the inlet velocity and nozzle axis on the primary breakup of a round liquid jet is unclear and will be investigated in the present study through high-fidelity simulation. The non-zero inlet angle induces an azimuthal variation of velocity in the liquid jet, which in turn influences the macro-scale jet dynamics, such as jet deflection and asymmetric deformation of the head of liquid jet. The simulations results of the global features, including jet deflection angle and temporal evolution of penetration length, are compared with experimental data and good agreement is achieved. The non-zero inlet angle is shown to impact small-scale interfacial wave formation and breakup. Wavelet analysis is performed to characterize the azimuthal variation of the interfacial waves in the near field.

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