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Numerical simulations of droplet breakup JOMELA MENG, TIM COLONIUS, California Institute of Technology — The deformation and breakup of a liquid droplet in the flow behind a normal shock is simulated by solving the compressible Navier-Stokes equations using a multicomponent, shock- and interface-capturing algorithm. Fluids in the solver are modeled using the stiffened gas equation of state, which closes the system of governing equations. The interface is represented using volume fractions, which are evolved via an additional advection equation. Comparisons are made with experimental results in the literature for various metrics of deformation and breakup. As the post shock flow velocity is varied from low subsonic to slightly supersonic speeds, its effect on the breakup process and droplet acceleration are analyzed. It is shown that the transition does not alter the similarity of the unsteady acceleration and drag coefficient curves, which are successfully collapsed for the range of simulated shock Mach numbers. The effects of viscosity on droplet breakup are explored through comparisons with previous inviscid results.

Jomela Meng
California Institute of Technology

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