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Compressibility effects in droplets impacted by a laser pulse STEN REIJERS, Physics of Fluids, Faculty of Science and Technology, University of Twente, The Netherlands, FEDERICO TOSCHI, Department of Applied Physics and Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands, DETLEF LOHSE, Physics of Fluids, Faculty of Science and Technology, University of Twente, The Netherlands, JACCO SNOEIJER, Mesoscopic Transport Phenomena, Eindhoven University of Technology, The Netherlands, HANNEKE GELDERBLOM, Physics of Fluids, Faculty of Science and Technology, University of Twente, The Netherlands — The impact of a laser pulse onto a liquid droplet can induce a strong deformation and propulsion of the droplet. We can model this laser impact as a one-sided pressure pulse applied on the liquid-vapor interface of the droplet. We aim to understand the fluid dynamic response of the droplet in a regime where the duration of the pressure pulse is very short, i.e. of the order of the timescale on which pressure waves travel through the droplet. We use Lattice-Boltzmann simulations to study the effects of pressure-wave propagation on a number of phenomena: energy partition, wave reflection on interfaces, droplet deformation and cavitation. We complement the simulation by a perturbation analysis of the Navier-Stokes equations in the weakly compressible regime. In the weakly compressible regime, we observe good agreement between the Lattice-Boltzmann simulations and this analytical model.

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