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Axisymmetric Lattice Boltzmann Simulation of Droplet Impact on Spherical Surfaces[1] XIN YONG, HUSSEIN DALGAMONI, Binghamton University — Droplet impact on solid surfaces plays important roles in many engineering applications, in which the ability to exert control over the detailed dynamics is critical. While past studies have established a complete understanding of droplet impact on flat substrates, what we know about the impact dynamics on curved surfaces is limited. This work simulated the normal impact of droplets on spherical surfaces with physical density and viscosity contrasts in the low Weber number regime, in which droplet deformation is assumed to be axisymmetric. We extended our recently developed axisymmetric free-energy lattice Boltzmann method (LBM) to capture droplet wetting and contact line motion on a curved surface. The conventional staircase approximation of curved boundaries was used to reduce computational cost. Its accuracy was validated by the static wetting simulations. The impact simulations show that surface curvature and wettability significantly affected the spreading and recoiling of droplet. Five impact outcomes were observed, which ranges from deposition to total rebound. An impact phase diagram was constructed and correlated with the total contact time to provide guidelines for surface design for anti-icing applications

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