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Thin film drainage of a deformable droplet moving toward a wall with finite inertia SHAOPING QUAN, Institute of High Performance Computing — Direct numerical simulations of a deformable droplet approaching toward a solid wall through another fluid are performed by solving the full Navier-Stokes equations using a finite volume/ moving mesh interface tracking method with high fidelity. Cases with Reynolds numbers of 25 and 50 and capillary numbers of 5×10^{-3} and 1×10^{-2} are simulated for both head-on and oblique approaching scenarios. The front head of the droplet is flattened as the droplet nearly touches the wall, and a dimpled thin film is observed. Because of the great viscous forces of the flow inside the thin film, the droplet slows down dramatically which leads to a significant increase of the drag force. An asymmetric thin film is observed for the oblique approaching. The numerical prediction on the central separation at which a dimple is formed agrees fairly well with previous analysis based on the lubrication theory. The simulated thinning rate is slower than the rate predicted by previous approximate models. The differences are mainly due to the finite Reynolds number of the simulated cases.

Shaoping Quan
Institute of High Performance Computing

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