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Inertial Wetting Kinetics for Nanometer Scale Droplets EDMUND WEBB III, BAIOU SHI, Lehigh University — Inertial spreading occurs immediately following contact between a droplet and solid surface. For low viscosity liquids with high wettability, high contact line velocities are observed during this stage. A counterintuitive result from atomic scale simulations is that even nanometer size metallic drops exhibit a regime of wetting that is governed by inertial effects. Using a Tolman length corrected surface tension to account for liquid/vapor interface curvature effects that manifest in small drops, inertial spreading data from molecular dynamics simulations for varying drop size (down to a few nm diameter) can be collapsed onto a single curve using otherwise continuum scale inertial capillary flow theory. In addition, for inertial spreading on a low advancing contact angle surface, a second nanoscale effect is observed, which is related to curvature gradients that manifest along a significant portion of the liquid/vapor interface in the smallest drops. This is caused by rapid advancement of a precursor wetting film. The duration of the inertial regime is computed and shown to scale with the inertial/capillary time scale. Evidence is presented that capillary waves play a role in determining the duration of the inertial wetting regime for low viscosity, highly wetting drops.

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