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A Mesh-Dependent Model For Applying Dynamic Contact Angles To VOF Simulations STÉPHANE ZALESKI, Universite Pierre et Marie Curie, SHAHRIAR AFKHAMI, Virginia Tech, MARKUS BUSSMANN, University of Toronto — Typical VOF algorithms rely on an implicit slip that scales with mesh refinement, to allow contact lines to move along no-slip boundaries. As a result, solutions of contact line phenomena vary continuously with mesh spacing; this study presents examples of that variation, when applying both no-slip and Navier-slip boundary conditions. A mesh-dependent dynamic contact angle model is then presented, that is based on fundamental hydrodynamics and serves as a more appropriate boundary condition at a moving contact line. This new boundary condition eliminates the stress singularity at the contact line; the resulting problem is thus well-posed and yields solutions that converge with mesh refinement. This scaling relationship is then used as a means to evaluate the contact angle boundary condition as a function of the apparent contact angle, θ_{app}, the capillary number, $\mathbf{Ca}$, and the mesh size, that yields mesh-independent solutions of dynamic contact line phenomena. Numerical results are presented of a solid plate withdrawing from a fluid pool, and of spontaneous droplet spread at small capillary and Reynolds numbers.

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