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Phase-field simulations of free surface laminar flows WALTER VILLANUEVA, Department of Mechanics, Royal Institute of Technology, KLARA ASP, JOHN ÅGREN, Department of Materials Science and Engineering, Royal Institute of Technology, GUSTAV AMBERG, Department of Mechanics, Royal Institute of Technology — The laminar flow dynamics of free surfaces that includes wetting and rigid body motion is studied. The Navier-Stokes equations with added forces of surface tension and gravity governs the motion of fluid. Convective phase-field and composition equations that are derived based on Gibbs free energy functional governs the dynamics of interfaces. The coupled system is nondimensionalized and adaptive finite element method is implemented. Two problems are presented. First, a basic wetting of a liquid drop on a solid surface is simulated. The dependence of the apparent contact angle on the Capillary number is found to match known experimental data. The second problem involves the attraction/repulsion of two rigid particles due to capillary forces. The rate of attraction/repulsion of the rigid bodies influenced by different wetting conditions is analyzed.

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