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Fluid structure in the immediate vicinity of an equilibrium contact line from first principles and assessment of disjoining pressure models ANDREAS NOLD, DAVID N. SIBLEY, Imperial College London, BENJAMIN D. GODDARD, The School of Mathematics and Maxwell Institute for Mathematical Sciences, The University of Edinburgh, SERAFIM KALLIADASIS, Imperial College London — Predicting the fluid structure at a three-phase contact line of macroscopic drops is of interest from a fundamental fluid dynamics point of view. However, exact computations for very small scales are prohibitive. As a consequence, coarse-grained quantities such as interface height and disjoining pressure profiles are used to model the interface shape. Here, we evaluate such coarse-grained models within a rigorous and self-consistent framework based on statistical mechanics, in particular with a Density Functional Theory (DFT) approach. We examine the nanoscale behavior of an equilibrium three-phase contact line in the presence of long-ranged intermolecular forces by employing DFT together with fundamental measure theory. Our analysis also enables us to evaluate the predictive quality of effective Hamiltonian models in the vicinity of the contact line. We compare the results for mean field effective Hamiltonians with disjoining pressures defined through the adsorption isotherm for a planar liquid film, and the normal force balance at the contact line [Phys. Fluids, **26**, 072001, 2014]. Results are given for a variety of contact angles. An accurate description of the small-scale behavior of a three-phase conjunction is a prerequisite to understanding dynamic wetting phenomena.

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