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Scale dependence of contact line computations[1] LEONID PISMEN, OLEG WEINSTEIN, Technion Israel Institute of Technology — The shape and velocity of a sliding droplet are computed by solving the Navier–Stokes equation with free interface boundary conditions. The Galerkin finite element method is implemented in a 2D computation domain discretized using an unstructured mesh with triangular elements. The mesh is refined recursively at the corners (contact points). The stationary sliding velocity is found to be strongly dependent on grid refinement, which is a consequence of the contact line singularity resolved through the effective slip across the finite elements adjacent to the contact point. For small droplets, this dependence is well approximated by a theoretical estimates obtained using multiscale expansion and matching technique in lubrication approximation, where the corner element size is used as a microscale parameter. For larger droplets, the shape is also dependent on grid refinement. This questions the validity of numerous computations of flows with moving contact line where grids are invariably much more coarse than molecular scales on which the singularity is resolved. It is suggested that extrapolation to molecular scales should be used to obtain realistic results. In order to alleviate computational process, we carry out a separate computation of flow in the vicinity of the contact line which can be matched to macroscopic flow.

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