Abstract Submitted
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From the Nano- to the Macroscale – Bridging Scales for the Moving Contact Line Problem ANDREAS NOLD, Imperial College London, DAVID SIBLEY, Loughborough University, BENJAMIN GODDARD, University of Edinburgh, SERAFIM KALLIADASIS, Imperial College London, COMPLEX MULTISCALE SYSTEMS TEAM — The moving contact line problem remains an unsolved fundamental problem in fluid mechanics. At the heart of the problem is its multiscale nature: a nanoscale region close to the solid boundary where the continuum hypothesis breaks down, must be resolved before effective macroscale parameters such as contact line friction and slip can be obtained. To capture nanoscale properties very close to the contact line and to establish a link to the macroscale behaviour, we employ classical density-functional theory (DFT) [1,2], in combination with extended Navier-Stokes-like equations. Using simple models for viscosity and slip at the wall, we compare our computations with the Molecular Kinetic Theory, by extracting the contact line friction, depending on the imposed temperature of the fluid [3]. A key fluid property captured by DFT is the fluid layering at the wall-fluid interface, which has a large effect on the shearing properties of a fluid. To capture this crucial property, we propose an anisotropic model for the viscosity, which also allows us to scrutinize the effect of fluid layering on contact line friction. [1] Math. Model. Nat. Phenom. 10 111 (2015) [2] Phys. Fluids 26 072001 (2014) [3] A. Nold, PhD Thesis, Imperial College London (2016)

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