Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Flow near the contact line of an evaporating drop HANNEKE GELDERBLOM, OSCAR BLOEMEN, ÁLVARO G. MARíN, DETLEF LOHSE, JACCO H. SNOEIJER, Physics of Fluids, University of Twente — Evaporation of water droplets with a pinned contact line is investigated in the entire range of possible contact angles (up to 150°). We measured the evolution of the mass and the contact angle of droplets on superhydrophobic carbon nanofiber substrates. The experimental data are in quantitative agreement with a diffusion-based model, and can be collapsed onto a single universal curve for all droplet sizes and initial contact angles. However, the nature of the flow inside the drop near the contact line has remained unclear: it has been argued that the lubrication approximation does not apply in the contact-line region, and that the Marangoni effect can overcome the evaporation-driven outward flow. Here, we resolve these questions by analytically solving the Stokes flow field in a wedge geometry, imposing the evaporative flux as a boundary condition.

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Date submitted: 04 Aug 2011 Electronic form version 1.4