Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Steady contact lines in a vapor-liquid system: truncated versus extended adsorbed microfilms[1] PIERRE COLINET, ALEXEY REDNIKOV, Universite Libre de Bruxelles, TIPs laboratory — The classical microscale theory of evaporating contact lines is revisited (for the case of a one-component liquid and its pure vapor) in the framework of a continuum lubrication-type model allowing the prediction of the apparent contact angle and of the microscale evaporation flux. The analysis is restricted to perfectly flat and homogeneous substrates maintained at constant temperature. While the classical theory, used for perfectly wetting situations, assumes the existence of an adsorbed microfilm extending all over the apparently dry portions of the superheated substrate, we here show that such regime may actually become metastable against a new regime with a truncated microfilm, ending up at a bare surface. Consideration of this new regime requires introducing the spreading coefficient into the picture, hence in some sense unifying two apparently unrelated ways of modeling contact line microstructures. In particular, the analysis also applies to partial wetting situations, and shows that the apparent contact angle only weakly deviates from Young's law in that case. Finally, while most of this theory is based on the usual inverse cubic law for the disjoining pressure, as in the classical case, slightly more general (non-singular) forms are also considered.

[1]Supported by FRS-FNRS, and by ESA & BELSPO PRODEX projects.

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Date submitted: 07 Aug 2010 Electronic form version 1.4