# Numerical simulation of an evaporative meniscus on a moving susbtrate

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An hydrodynamic model based on lubrication theory has been recently developed to get a complete description of an evaporative meniscus in total wetting configuration, when evaporation takes place in air at atmospheric pressure [1]. Evaporation is thus driven by vapor diffusion in the gaz phase, then the coupling between liquid and gas must be explicitly taken into account, making the determination of the local evaporation flux a non local problem [2]. Although considering a total wetting situation, a non-zero effective contact angle can result from evaporation or substrate motion. A disjoining pressure approach is used to describe van der Waals interactions between the liquid and the solid substrate. The model allows the prediction of the effective contact angle, as well as the determination of the complete meniscus structure, from the bulk dominated by capillary pressure to the liquid film adsorbed on the substrate and governed by disjoining pressure. Scaling laws describing the different domains of the meniscus has been previously derived for a motionless substrate, and validated by numerical simulations. This study focus on conjugated effects of evaporation and substrate motion. Results show two distinct regimes when varying the substrate velocity on several orders of magnitude. At slow velocity, the meniscus structure is governed by evaporation and is independent of substrate velocity. On the contrary, at high velocity, evaporation turns to have a negligible effect on the meniscus macroscopic behaviour. A Landau-Levich regime is then obtained in the case of a receding contact line, and a Cox-Voinov regime in the case of an advancing contact line. Finally results are compared with simplifed models of the literature [3, 4].

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