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Heat transfer in the vicinity of a steady evaporating contact line SEVERINE ROSSOMME, Universite Libre de Bruxelles, BENOIT SCHEID, Harvard University, PIERRE COLINET, Universite Libre de Bruxelles — The quantitative determination of overall heat transfer in the vicinity of contact lines is crucial for many heat transfer devices such as heat pipes and boilers. In this context, a long-wave evolution equation describing the evaporation of an ultra-thin film is solved, focusing on nonlinear solutions in the form of contact lines connecting a constant slope region to an adsorbed precursor film. First, the latter film is found to be stable to hydrodynamic disturbances, via linear stability analysis. Then, the main characteristics of evaporating contact lines are analyzed, with particular attention to the sharp peak of the heat flux occurring in the transition region, which results in a microscopic (though non-negligible) contribution to the overall heat transfer. The latter is then quantified as a function of the thermal conductivity of the solid, the mass transfer resistance, the interface curvature and the Van der Waals forces, including their influence on the saturation temperature. For small superheat, a useful scaling behavior is found for the apparent contact angle and for the heat flux characteristics.

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