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Evolution of droplets of perfectly wetting liquid under the influence of thermocapillary forces SHOMEEK MUKHOPADHYAY, Chemistry, Columbia University, NEBOJSA MURISIC, Mathematics, UCLA, ROBERT P. BEHRINGER, Physics, Duke University, LOU KONDIC, Mathematical Sciences, New Jersey Institute of Technology — We consider evolution of sessile droplets of a nonvolatile perfectly wetting liquid on differentially radially heated solid substrates. The heating induces thermocapillary Marangoni forces which affect the contact line dynamics. In our experiments, we witness the opposing action of the thermocapillary Marangoni effect and capillary spreading. We record an interesting feature which develops during this phase – while the bulk of the drop mass recedes toward the center, the contact line recedes at a much slower rate, leaving a stretched layer of liquid between the main body of the drop and the contact line. We find that this layer of liquid thins as evolution of the drop proceeds and that the thinning is more pronounced when the imposed temperature gradient in the contact line region is larger. Our theoretical model, based on the lubrication approximation and incorporating the Marangoni effect, recovers the main features observed in the experiments. The model also indicates a strong dependence of the drop shape on the imposed temperature gradient, and, for a particular class of temperature profiles, it predicts formation of a ridge between the thin liquid layer and the main body of the drop, which is still to be observed in experiments.

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