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**Thermocapillary-driven motion of a droplet on an inclined substrate: contact line dynamics, and non-monotonic dependence of surface tension on temperature** GEORGE KARAPETSAS, University of Thessaly, KIRTI SAHU, Indian Institute of Technology, Hyderabad, KHELLIL SEFIANE, University of Edinburgh, OMAR MATAR, Imperial College London — We consider the two-dimensional motion of a droplet on an inclined, non-isothermal solid substrate. We use the lubrication approximation to obtain a single evolution equation for the interface, which accounts for gravity, capillarity, and thermo-capillarity, brought about by the dependence of the surface tension on temperature. For the latter, a nonlinear function is used, which exhibits a well-defined minimum. The contact line motion is modelled by coupling the contact line speed to the difference between the dynamic and equilibrium contact angles; the latter vary dynamically during the droplet motion through the dependence of the liquid-gas, liquid-solid, and solid-gas surface tensions on the local contact line temperature. Thus, the local substrate wettability also varies dynamically at the two edges of the drop. A full parametric study is carried out for constant substrate temperature gradients in order to investigate the interplay between Marangoni stresses, induced by thermocapillarity, gravity, and contact line dynamics in the presence of local wettability variations, and non-monotonic dependence of the surface tension on temperature. The results of this study are presented together with comparisons against experimental data.

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