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Computational modeling of quasistatic Leidenfrost drops[1] INDRAJIT CHAKRABORTY, MYKYTA V CHUBYNSKY, JAMES E SPRITTLES, Mathematics Institute, University of Warwick, Coventry CV4 7AL, United Kingdom — In the Leidenfrost effect, drops levitate on a thin film of vapor generated by the evaporation of the liquid above a solid surface heated beyond the Leidenfrost temperature. A previous model [1] predicted the quasistatic shape of a Leidenfrost drop by using the lubrication approximation for the vapor but neglecting flow in the drop. We find that the original numerical solution of the model in [1] contains inaccuracies; the corrected solution exhibits new experimentally-observed features including (i) a regime with a dimple-less bottom surface of the drop and (ii) a minimum in the vapor layer thickness as a function of the drop size [2]. Next, we extend the model by coupling the lubrication equation for the vapor to the axisymmetric Navier-Stokes equations for the flow within the drop and solve the resulting model computationally. For high liquid viscosities, our results agree with the corrected solution of the model in [1], as expected. However, for water viscosity there are discrepancies for large drops and paradoxically, the model in [1] agrees better with experiments [3]. We discuss possible reasons for this result. [1] Sobac et al., Phys. Rev. E. 90, 053011 (2014). [2] Celestini et al., Phys. Rev. Lett. 109, 034501 (2012). [3] Burton et al., Phys. Rev. Lett. 109, 074301 (20

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