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Shape bifurcations of evaporating droplets on smooth patterned surfaces[1] MATTHEW HAYNES, Department of Mathematics and Statistics, The Open University, GARY WELLS, RODRIGO LEDESMA-AGUILAR, Smart Materials and Surfaces Laboratory, Northumbria University, MARC PRADAS, Department of Mathematics and Statistics, The Open University — With the recent development of smooth, pinning-free surfaces it has become important to understand the evolution process of an evaporating droplet resting on such a surface. A two-dimensional study of this problem has recently reported a new mode of evaporation in which the droplet follows a reproducible sequence of configurations, consisting of a quasi-static phase-change interrupted by out-of-equilibrium snaps that are triggered by shape bifurcations. Here, we shall introduce a three-dimensional model of this problem, where we use a thin film approximation to reduce the Young-Laplace equation to a Poisson equation. Solutions are found by means of a Fourier series expansion. We shall present evidence of snap evaporation for a variety of chemical patterns, and use bifurcation diagrams to quantify the dynamic evolution of the droplet.

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