Oberseminar Nichtlineare Differentialgleichungen

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Pattern formation and film rupture in thermocapillary thin-films

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Abstract: The Bénard-Marangoni problem models a fluid film on a heated surface and exhibits rich dynamical phenomena when the purely conductive steady state destabilises. On the one hand, one can observe the formation of hexagonal patterns close to a short-wave instability. On the other hand, a long-wave instability can lead to finite-time film rupture, where the surface profile touches the bottom surface. Both phenomena are driven by thermocapillary effects due to a temperature-dependent surface tension.

In this talk, I discuss recent results on the existence of spatially periodic steady states in an asymptotic thermocapillary thin-film model, which can be formally derived from the full Bénard-Marangoni problem using lubrication approximation. These solutions lie on a global bifurcation branch and accumulate at a steady film-rupture solution. The main tools are analytic global bifurcation theory and the observation that the spatial dynamics formulation of the steady state problem has a Hamiltonian structure.

This is joint work with Gabriele Brüll and Jonas Jansen (both Lund).

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