DY 41: Talk U. Thiele

Time: Wednesday 9:30–10:00 Location: BH-N 334

Invited Talk DY 41.1 Wed 9:30 BH-N 334

From bifurcations of single sliding drops to their ensemble statistics — •Uwe Thiele — Institute for Theoretical Physics and Center of Nonlinear Science (CeNoS), WWU Münster, 48149 Münster.

We study the nonlinear dynamics of individual sliding drops and of large ensembles. After introducing the modelling of capillarity and wettability in mesoscopic hydrodynamics we first employ path-continuation [1] to analyse periodic trains of stationary sliding drops and show that qualitative transitions occur at saddle-node bifurcations. A global bifurcation results in pearling-coalescence cycles that show the period-doubling route to chaos [2]. Second, we simulate the evolution of large drop ensembles and show that the interplay of coalescence and pearling results in a stationary drop size distribution that may be understood from the single-drop bifurcation diagram. Then a coarse-grained statistical model for the dynamics of the drop size distribution is developed that well captures the features of the evolution [3]. Finally, we consider the effects of substrate heterogeneities and continuous condensation of liquid onto the substrate. We show that then the interplay of condensation, (de)pinning, coarsening and pearling also results in a stationary distribution that can be related to single-drop bifurcation diagrams. [1] Using PDE2PATH, see H. Uecker, D. Wetzel and J.D.M Rademacher, Num. Math.-Theory Meth. Appl. 7, 58 (2014); [2] S. Engelnkemper, M. Wilczek, S.V. Gurevich and U. Thiele, Phys. Rev. Fluids 1, 073901 (2016); [3] M. Wilczek, W. Tewes, S. Engelnkemper, S.V. Gurevich and U. Thiele, Phys. Rev. Lett. 119, 204501 (2017).