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Bifurcation analysis of the behavior of partially wetting liquids on a rotating cylinder DMITRI TSELUIKO, Loughborough University, TE-SHENG LIN, National Chiao Tung University, UWE THIELE, University of Muenster — We analyze the behavior of a partially wetting liquid on a rotating cylinder using the model of Thiele [1] that takes into account the effects of gravity, viscosity, rotation, surface tension and liquids wettability. Such a system can be considered as a prototype for many other systems with a spatial heterogeneity and a lateral driving force in the proximity of a first- or second-order phase transition. Thiele [1] found that a partially wetting drop on a rotating cylinder undergoes a depinning transition as the rotation speed is increased, whereas for ideally wetting liquids the behavior changes monotonically. We analyze in detail the transition in the bifurcation behavior for partially wetting liquids as the wettability of the liquid decreases, and, in particular, how the global bifurcation related to depinning of drops is created when increasing the contact angle. We employ various numerical continuation techniques that allow us to track stable and unstable steady and time-periodic states. We support our findings by time-dependent numerical simulations and asymptotic analysis of steady-state and time-periodic solutions for large rotation numbers. [1] U. Thiele, "On the depinning of a drop of partially wetting liquid on a rotating cylinder," J. Fluid Mech. 671, 121-136 (2011)

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