## Abstract Submitted for the DFD13 Meeting of The American Physical Society

Surfactant on a Thin Liquid Layer: Self-Healing Dynamics<sup>1</sup> STEPHEN STRICKLAND, North Carolina State University, CAMERON CONTI, MATT HIN, RICHARD SAYANAGI, Harvey Mudd College, KAREN DANIELS, North Carolina State University, RACHEL LEVY, Harvey Mudd College — As in the previous talk, we explore the dynamics of an insoluble surfactant spreading on a thin viscous Newtonian layer. Here, a central disk-shaped surfactant-free region heals, with the fluid layer ideally becoming entirely coated with surfactant. In the initial dynamics of this self-healing, Marangoni forces drive an axisymmetric annular ridge inward to coalesce into a growing central fluid distension, unlike outward spreading in which the ridge decays. In later dynamics, this distension slowly relaxes and the surfactant concentration equilibrates. We measure the surfactant concentration profile through fluorescence imaging of tagged lipids, while simultaneously measuring the height profile with laser profilometry. For surfactant concentrations close to but below the critical monolayer concentration, we observe agreement between the height profiles in the numerical simulations and the experiment, but disagreement in the surfactant distribution. In experiments at lower concentrations, the surfactant spreading and formation of a Marangoni ridge are not present, leaving a hole which is essentially surfactant-free. This observation, not captured at all in simulations, may have undesirable implications for applications such as drug delivery.

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