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Dynamics of Marangoni Driven thin film flows
SHOMEER MUKHOPADHYAY, ROBERT BEHRINGER, Physics Department and Center for Nonlinear and Complex Systems, Duke University, Durham, NC – 27708 — We study the dynamics of thermally driven Marangoni flows of Polydimethylsiloxane (PDMS or silicone oil) on a completely wetting silicon wafer. A thin film of silicone oil is driven up the inclined plane against gravity by imposing a temperature gradient. Previous work has focused on the formation of ‘shock’ structures and the analysis of fingers in thermally driven thin film flows. In this study we will perform a detailed analysis of how the contact line emerges from the meniscus. As the contact line emerges from the reservoir, the formation of a ‘precursor’ or ‘foot’ is seen. We study the emergence of this ‘precursor’ as a function of the temperature gradient, angle of inclination and the deposited film thickness. In particular we consider the case where the meniscus typically shows a ‘dip’ before decaying into the flat film as opposed to a ‘monotonic’ decay. Such a meniscus shape has been predicted on theoretical grounds for very thick films by Muench and Evans.

Prefer Oral Session
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