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Thermally driven film climbing a vertical cylinder LINDA SMOLKA, Bucknell University — The dynamics of a Marangoni driven film climbing the outside of a vertical cylinder is examined in numerical simulations of a thin film model. The model has three parameters: the scaled cylinder radius $\hat{R}$, upstream film height h_∞ and downstream precursor film thickness b, and reduces to the model for Marangoni driven film climbing a vertical plate when $\hat{R} \to \infty$. The advancing front displays dynamics similar to that along a vertical plate where, depending on h_∞, the film forms a Lax shock, an undercompressive double shock or a rarefaction-undercompressive shock. A linear stability analysis of the Lax shock reveals the number of fingers that form along the contact line increases linearly with cylinder circumference while no fingers form below $\hat{R} \approx 1.15$ with $b = 0.1$. The substrate curvature controls the Lax shock height, bounds on h_∞ that define the three solutions and the maximum growth rate of perturbations when $\hat{R} = O(1)$, whereas the shape of solutions and the stability of the Lax shock converge to the behavior on a vertical plate when $\hat{R} \geq O(10)$. The azimuthal curvatures of the base state and perturbation, arising from the annular geometry of the film, promote instability of the advancing contact line.

Linda Smolka
Bucknell University

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