

Abstract Submitted
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The Rayleigh-Taylor instability for a thin film on the inside of a horizontal cylinder NAIMA HAMMOUD, Princeton University, PHILIPPE TRINH, PETER HOWELL, JONATHAN CHAPMAN, Oxford University, HOWARD STONE, Princeton University — Thin films on curved surfaces are widely observed in coating and painting processes and wetting problems. We consider a thin film on a curved substrate under the effect of gravitational, viscous, and surface tension forces. When the film is on the underside of the substrate, gravity works as a destabilizing force, and a Rayleigh-Taylor type instability is expected. We consider the stability of a uniform thin film coating the inside of a horizontal circular cylinder. Using asymptotic methods, we find that instabilities are of a transient nature, thus showing that curvature helps stabilize the film. We also find that these “instabilities” occur primarily in the angular direction with the axial perturbations only appearing as higher-order corrections. These results seem to agree well with experiments (H. Kim et al., this conference).

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