Transient amplification and nonlinear stability of driven thin films

ROMAN GRIGORIEV, RADFORD MITCHELL, Georgia Tech — Transient amplification of small disturbances (e.g., microscale surface roughness or chemical heterogeneity) has been suggested as an alternative explanation for contact line instability in thin liquid films spreading over solid substrates. Although transient growth has been observed experimentally (for thermocapillary-driven flows), reasonable theoretical understanding of this phenomenon has been achieved only in the limit of infinitesimal disturbances. Here we present the results of an analytical study of gravity-driven films which goes beyond linear stability analysis by considering the effect of nonlinearities on the asymptotic behavior of finite disturbances.

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