Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Imposing periodic suction to stabilise thin-film flow down an inclined plane[1] ALICE THOMPSON, DEMETRIOS PAPAGEORGIOU, Imperial College London, DMITRI TSELUIKO, University of Loughborough, IMPERIAL COLLABORATION, LOUGHBOROUGH COLLABORATION — Flow of a thin film down an inclined plane becomes unstable when the slope angle or Reynolds number are sufficiently large; enhancement or suppression of these instabilities is relevant to a range of industrial applications. Here we study the effect of introducing spatially periodic blowing and sucking through the rigid planar boundary. We derive two long-wave, thin-film models to describe the system, including the imposed suction as well as inertia, surface tension, gravity and viscosity. We explore the bifurcation structure in each model, and perform linear stability and time-dependent simulations for both small and large forcing amplitude. Both models predict that forcing via imposed suction can be chosen to either destabilize or stabilize the flow, and we show that forcing at very long wavelengths always has a stabilizing effect on the flow.

[1]Support provided by the EPSRC grant number EP/K041134/1

Demetrios Papageorgiou
Imperial College London

Date submitted: 29 Jul 2014 Electronic form version 1.4