

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Electrified film flows at moderate Reynolds number¹ RICHARD CRASTER, ALEX WRAY, DEMETRIOS PAPAGEORGIOU, OMAR MATAR, Imperial College London — We examine the flow of a thin, inclined film sandwiched between two parallel electrodes. We follow the Weighted Residual Integral Boundary Layer method, which has been shown via comparison with both direct numerical simulations and experiments to give good results in both the drag-gravity and drag-inertia regimes. We extend existing models to give an accurate model of electrostatic effects via a similar separation of variables approach. A disparity in material properties between the liquid and gas regions induces a Maxwell stress at the interface, which affords a significant degree of control over the behaviour of the film. In one dimension, linear stability comparisons are made with a full Orr-Sommerfeld calculation, and nonlinear comparisons are made with direct numerical simulations, both showing excellent agreement in large parts of parameter space. The model is also extended to fully two-dimensional simulations.

¹EPSRC Programme Grant, MEMPHIS, EP/K0039761/1, EPSRC DTG Studentship (AWW)

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Date submitted: 25 Jul 2014

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