Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Control of complex dynamics in highly conducting thin annular films[1] DEMETRIOS PAPAGEORGIOU, ALEX WRAY, OMAR MATAR, Imperial College London — Thin, highly conducting annular films represent a canonical scenario giving rise to both mathematical interest and practical physical relevance. A precise and complete understanding of the dynamics of such a flow is vital for its effective manipulation. We look at the case of a thin, highly conductive film on the outer surface of a conductive cylinder, with a potential difference set up between the coating cylinder and second, concentric cylinder. The disparity of electrical material properties in the two regions induces additional electric stresses at the interface. Asymptotic methods are used to derive a thin film type equation governing this situation. These lead to an additional term in the gravitationally modified Hammond equation, with a modified mobility coefficient, which can either augment disturbances, or drive them to cessation. We discuss the intricate effect that this has on both the linear and nonlinear regimes in one dimension. We also discuss briefly the full two-dimensional dynamics via transient numerical simulations.

[1]EPSRC DTA

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Date submitted: 30 Jul 2012 Electronic form version 1.4