Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Long-wave dynamics in two-layer channel flow CHRIS LAWRENCE, Institute for Energy Technology, Norway, GRIGORI SISOEV, Birmingham University, OMAR MATAR, Imperial College London — The dynamics of an interface separating two viscous fluids in a channel are examined. The flow is taken to be either laminar in both layers or turbulent in one of them. In each case, asymptotic reduction and the integral method are used to derive a single evolution equation for the interface, which accounts for inertia, capillarity and shear stress. These equations are shown to reduce to Benney- like equations and the Kuramoto-Sivashinskii equation in the thin film limit. The linear stability characteristics of the interface in the long-wave limit are analysed and compared to those obtained via solution of the Orr-Sommerfeld equation. Bifurcation theory is then used to catalogue the various periodic wave regimes that accompany the flow as a function of system parameters. Finally, transient numerical simulations are carried out in order to elucidate the wave selection mechanism downstream of the channel inlet.

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Date submitted: 18 Jul 2006 Electronic form version 1.4