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**Shock-wave solutions and their stability in two-layer channel flow**[1] ALIKI MAVROMOUSTAKI, RICHARD CRASTER, Imperial College London, OMAR MATAR — We study the dynamics of an interface separating two immiscible layers in an inclined channel. Lubrication theory is used to derive an evolution equation for the interface position that models the two-dimensional flow in both co- and counter-current configurations. This equation is parameterized by viscosity and density ratios, and a total dimensionless flow rate; the system is further characterized by the height of the interface at the channel inlet and outlet, which are treated as additional parameters. For one-dimensional flows, we use an entropy-flux analysis to delineate the existence of various types of shock- like solutions, which include compressive Lax-shocks, pairs of Lax and undercompressive shocks, and rarefaction waves. Flows characterised by unstably-stratified layers are accompanied by the formation of propagating, large-amplitude interfacial waves, which are not shock-like in nature. The results of our transient numerical simulations agree with our analytical predictions and elucidate the mechanisms underlying spatio-temporal development of the various types of waves. The linear and nonlinear stability of these waves to spanwise perturbations is also investigated.

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