Dynamics and Stability of Thin Film on a porous inclined plane
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MOHAMMED RIZWAN SADIQ, IITM, Chennai, India — The flow of a thin vis-
cous incompressible film on a porous inclined plane is considered. The long wave
theory is applied and an evolution equation for the film thickness is obtained. It is
assumed that the flow through the porous medium is governed by Darcy’s law. The
characteristic length scale of the pore space is much smaller than the depth of the
fluid layer on the inclined plane. The critical condition for the onset of instability is
obtained. The results of the linear stability analysis reveal that the film flow system
on a porous inclined plane is more unstable than on a rigid wall. The increase of
permeability of the porous medium enhances the destabilizing effect. The existence
of both supercritical stable and subcritical unstable states is established through the
weakly nonlinear stability analysis. The nonlinear waves in the supercritical stable
region are captured numerically. The solutions exhibit different kinds of typical
waves such as nearly sinusoidal and solitary waves at long times. The shape and
amplitude of such waves are strongly influenced by the permeability of the porous
wall. Further the steady state solution profiles are determined for various values of
the permeability parameter.

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