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Wavy regimes of a film flow down a slip inclined plane[1] ARGHYA SAMANTA, CHRISTIAN RUYER-QUIL, Université Pierre et Marie Curie , BENOIT GOYEAU, Ecole Centrale de Paris — Consider a 2D viscous incompressible liquid film flow down a slip inclined plane under the action of gravitational force. Two coupled depth averaged equations are derived in terms of the flow rate $q(x,t)$ and the film thickness $h(x,t)$ within the framework of boundary layer approximations together with weighted-residual technique. Linear stability analysis of the averaged equations show good agreement with the results of Orr-Sommerfeld analysis of linearized basic equations. At small values of Reynolds number, presence of slip length is destabilizing whereas it becomes stabilizing at moderate values of Reynolds number. This phenomena indicates the nontrivial stabilizing effect of slip length on the primary instability. In the nonlinear regime, the influence of slip length has been investigated through traveling-wave solutions of the averaged equations. Comparisons with direct numerical simulations of Navier-Stoke's equations also show good agreement.

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