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Weighted integral boundary layer method for thin films along parallel undulating structures MOHAMMED RIZWAN SADIQ IQBAL, Department of Mathematics and Statistics, University of Konstanz — A first order weighted integral boundary layer method is derived for a falling film along parallel undulated structures under isothermal conditions. The linear stability of the equilibrium flow, which is derived under asymptotic approach based on small amplitude undulations of the system, is assessed theoretically under certain limiting cases. The complex eigenvalue problem for the linear stability is studied numerically on a periodic domain. For the flow on a planar geometry, the linear stability results of the present model are found to be in good agreement with the experimental data available in literature and predicts the results at the Hopf bifurcation threshold accurately. For an undulating geometry, the amplitude of the undulations play a crucial role in stabilizing the film flow. The evolution triggered by small disturbances to the equilibrium profile is studied numerically by integrating the system using a fast Fourier transform to evaluate the spatial derivatives and a fourth order Runge-Kutta scheme to march in the temporal direction. The maximum film thickness profile computed numerically confirms the stabilizing nature of undulations of the structure as shown by the linear stability results.

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