Nonlinear dynamics of a high Reynolds-number film flow under an electrostatic field

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In this research, the mathematical solitary waves were derived applying the integral boundary layer theory into the Navier-Stoke's equations for a film flow. Two equations have been obtained for describing the local film thickness and flow rate of a finite amplitude surface wave. The Finite Fourier Transform technique was employed to integrate these time-dependent wave equations. The resulting waves on the moving coordinates show more unstable behavior than those introduced by the lubrication theory in terms of the intensity concept. As a result, the perpendicularly applied electrostatic filed acts as a destabilizing factor.