Solitary waves in a high Reynolds number falling film under an electrostatic field

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The stability problems of solitary waves in a high Reynolds number falling film have been studied in an electrostatic field. For this purpose, the evolving finite-amplitude surface wave has been described by Karman-Polhausen integral boundary layer theory. Linear stability theory shows the destabilizing effect of an applied electrostatic field on a long wave in the inception region. Far away from the linear stability theory can approximately predict the motion of the surface wave, developed solitary waves have been pursued by taking advantage of moving coordinates at the same velocity as the wave. Following the some stability theories, the existence of solitary waves has been mathematically approached: fixed points in the phase space which means Nusselt film thickness should be found, then the characteristics of the sink and the source of each point has been confirmed by the linearized system. From special solutions, the existence and the characteristics of pulse-like solitary wave can be acquired either qualitatively or quantitatively. We have verified the solitary wave's characteristics, existences and so forth mentioned in moving-coordinates analysis by comparing the two results.