

Abstract Submitted
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Dynamics of turbulent falling films LENNON O’NARAIGH, University College Dublin, OMAR MATAR, Imperial College London — The dynamics of laminar falling films have received considerable attention over the past several decades. In contrast, turbulent falling films have been the subject of far fewer studies. We seek to redress this balance by studying the stability of falling films which have already undergone a transition from a laminar to a turbulent flow regime. We derive a uniform-film base-state for this flow by assuming the averaged turbulent velocity field to be steady and fully-developed, and by employing a modified version of mixing-length theory. The latter features an interpolation function for the eddy viscosity, and van Driest-type functions for turbulence-damping near the wall and interface regions. The predicted base-state streamwise velocity component is in good agreement with experimental data. A linear stability analysis of this base-state is then carried out by solving a modified version of the Orr-Sommerfeld equation. Our results suggest that the unstable mode is a long-wave one. This provides motivation for the derivation of long-wave equations for the nonlinear evolution of the film.

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