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Onset of Dynamic Wetting Failure: The Influence of the Displaced Fluid ERIC VANDRE, University of Minnesota, MARCIO CARVALHO, Pontifícia Universidade Católica do Rio de Janeiro, SATISH KUMAR, University of Minnesota — Dynamic wetting involves the displacement of fluid on a solid surface by an advancing liquid, and is essential to the successful operation of coating processes. In this work, we consider a model problem in order to examine the influence of the displaced fluid on the failure of dynamic wetting. Full two-dimensional (2D) calculations over a broad range of parameters are performed using the finite element method (FEM), and the results are compared to prior experiments and asymptotic analysis. This comparison motivates the development of a novel and efficient hybrid computational method that combines 2D FEM for the liquid and lubrication theory for the displaced fluid. We will discuss the limits of applicability of the hybrid approach, and its ability to describe realistic coating flows. Overall, our results highlight the significant influence of the displaced fluid on the conditions at which dynamic wetting failure occurs, along with the underlying physical mechanisms.

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