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STABILITY OF RECEDING TRAVELING WAVES IN VISCOUS THIN FILMS

We consider the thin-film equation $h_t + (hh_{yyy})_y = 0$ with a zero contact angle at the free boundary, that is, at the triple junction where liquid, gas, and solid meet. Previous results on stability and well-posedness of this equation have focused on perturbations of equilibrium-stationary or self-similar profiles, the latter eventually wetting the whole surface.

In this talk, we consider traveling waves $h = \frac{V}{6}x^3 + \nu x^2$ for $x \geq 0$, where $x = y - Vt$ and $V, \nu \geq 0$ are free parameters. These traveling waves are receding and therefore describe de-wetting, a phenomenon genuinely linked to the fourth-order nature of the thin-film equation and not encountered in the porous-medium case as it violates the comparison principle.

To study the asymptotic stability of these waves, we carry a stability analysis on a linear fourth-order degenerate-parabolic operator for which we prove maximal-regularity estimates to arbitrary orders of the expansion in x in a right-neighborhood of the contact line $x = 0$. This leads to a well-posedness and stability result for the corresponding nonlinear equation. As the linearized evolution scales differently when $x \searrow 0$ and $x \to \infty$, the analysis is more intricate than in related previous works, and offers the opportunity to investigate other situations in which the comparison principle is violated, such as rupture of droplets.