Gevrey stability of Prandtl expansions for two-dimensional Navier-Stokes flows

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We consider the inviscid limit problem for the two-dimensional incompressible Navier-Stokes equations and study the stability of shear-type boundary layer solutions. It is known that under the standard no-slip boundary condition on velocity fields the viscous boundary layer exhibits a strong instability in high frequencies. We show that if the initial boundary layer is of shear type which is monotonic and concave in the vertical variable then the shear boundary layer is stable over some time interval $(0, T)$ in the inviscid limit, under perturbations with Gevrey regularity in the tangential variable. This is the first result which verifies the Prandtl asymptotic expansion for viscous incompressible flows beyond the analytic framework. The optimality of our Gevrey exponent for stability is also presented. This talk is based on a joint work with David Gerard-Varet (Paris 7) and Nader Masmoudi (New York University).