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Unsteady boundary layer detachment in planar flows at large Reynolds number ROMAIN NGUYEN VAN YEN, Freie Universität Berlin, MARIE FARGE, ENS, CNRS, Paris, MATTHIAS WAIDMANN, RUPERT KLEIN, Freie Universität Berlin, KAI SCHNEIDER, Aix Marseille Univerité — We study a vortex dipole impinging onto a wall with two different models: Navier-Stokes equations and Euler's equation coupled with Prandtl's boundary layer equation. The solutions in the limit of large Reynolds number Re are computed by DNS performed using a high-order compact finite differences scheme with no-slip boundary conditions. For both models we first observe the formation on the wall of two opposite-sign boundary layers whose thickness scales in $Re^{-1/2}$, as predicted by Prandtl in 1904. At a later time t_D the solution of the Navier-Stokes equation shows that the boundary layers suddenly collapse down to thickness as fine as Re^{-1}, as predicted by Kato in 1984, then detach from the wall and roll up into strongly dissipative new dipoles that are ejected away from the wall into the bulk flow. In contrast, at the same time t_D Prandtl's solution becomes singular and the boundary layers can no more be computed, while Euler's solution gives two opposite sign-vortices that slip along the wall in opposite directions without detaching.

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