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Large Reynolds number streak description using RNS JUAN MARTIN, CARLOS MARTEL, ETSI Aeronauticos, Universidad Politecnica de Madrid — It has been recently shown [Choi, Nature, April 06 - Cossu et al., PRL, February 06] that the inclusion of 3D streaky structures in the boundary layer can make it remain laminar longer than the purely 2D Blasius flow. We compute the development of 3D streaks in the boundary layer over a flat plate using the so-called Reduced Navier Stokes equations (RNS). The RNS are a boundary layer like formulation, which is derived from the Navier-Stokes equations making use of the fact that in the large Re limit two very different spatial scales are present: one long (streamwise direction) and two short (spanwise and wall-normal direction). The resulting RNS are a nonlinear, parabolic, Re independent system that describes the streak structure in the large Re limit. The RNS streak computations are also much more less CPU costly than DNS for high Re, and they don't have the numerical problems that the PSE formulation exhibits (divergence of the results for small Δx, or blow-up of the solution when the amplitude of the deviation from Blasius is not small). In this work we comment the details of the numerical integration of the RNS, and we present some comparisons of the RNS results with the linear computations of streak development together with some fully nonlinear computations of streak evolution.

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