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Transversal motion and flow structure of fully nonlinear streaks in a laminar boundary layer JUAN ANGEL MARTIN, CARLOS MARTEL, Universidad Politecnica de Madrid, DENLIA TEAM — Typical streak computations present in the literature correspond to linear streaks or to small amplitude nonlinear streaks computed using DNS or nonlinear PSE. We use the Reduced Navier-Stokes (RNS) equations to compute the streamwise evolution of fully non-linear streaks with high amplitude in a laminar flat plate boundary layer. The RNS formulation provides Reynolds number independent solutions that are asymptotically exact in the limit $Re \gg 1$, it requires much less computational effort than DNS, and it does not have the consistency and convergence problems of the PSE. We present various streak computations to show that the flow configuration changes substantially when the amplitude of the streaks grows and the nonlinear effects come into play. The transversal motion (in the wall normal-streamwise plane) becomes more important and strongly distorts the streamwise velocity profiles, that end up being quite different from those of the linear case. We analyze in detail the resulting flow patterns for the nonlinearly saturated streaks and compare them with available experimental results.

Juan Angel Martin
Universidad Politecnica de Madrid

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