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Modal description of optimal internal streaks in a Falkner-Skan Boundary Layer JOSE SANCHEZ-ALVAREZ, MARIA HIGUERA, JOSE MANUEL VEGA, ETSI Aeronauticos. UPM — Understanding the growing disturbances in boundary layers is of crucial interest for numerous engineering applications. Here we examine the optimal streaky perturbations (which maximize energy growth) in a wedge flow boundary layer. These 3D perturbations are governed by a system of equations obtained by linearizing the 3D Navier-Stokes equations around the base flow given by the Falkner-Skan similarity solution. Based on an asymptotic analysis of this system near the free stream and the leading edge singularity, we show that optimal streaks can be described in terms of a single streamwise-growing solution of the linearized equations, which is associated with an eigenvalue problem first formulated in this context by Tumin (Phys. Fluids 13, 5, (2001)). Such a solution may be regarded as an internal spatially-unstable mode, in analogy with the usual eigenmodes of standard linear stability theory. An important consequence of this result is that the optimization procedure heretofore used to define optimal streaks is not necessary. Comparison with previous results in A.Tumin and D.E. Ashpis AIAA (2003) show excellent agreement.

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