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Experimental evidence of the Self Sustaining Process in a flat plate boundary layer THOMAS DURIEZ, JEAN-LUC AIDER, JOSE EDUARDO WESFREID, PMMH / ESPCI — Streamwise velocity streaks and streamwise vorticity are both key features of the boundary layer and are involved into its transition to turbulence. It has been proposed that a Self Sustaining Process (SSP) exists between these structures from a given Reynolds number. We use bluff-body vortex generators to steadily force a flat plate boundary layer with counter-rotating streamwise vortices (CRSV) in a hydrodynamic tunnel at moderate Reynolds numbers. Using 2-Component 2-Dimensional Particle Image Velocimetry we reconstruct the 3-Dimensional time averaged flow field for both streamwise and spanwise components. By associating the modulation on the spanwise component to the CRSVs and the modulation on the streamwise component to the velocity streaks we witness the evolution of these structures. Using a parametric study on the Reynolds number we study the evolution of the streamwise streaks transient growth. Monitoring the evolution of the amplitude of the CRSV we show the transition from their decay at low Reynolds number to the existence of the SSP. Looking at the instantaneous vector fields we propose the destabilization of the streamwise streaks as the process responsible to the existence of a critical Reynolds number for the SSP.

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