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Non Linear Base Flow Modification by Streamwise Vortices Induced by Vortex Generators Application to the Control of Separated Flows THOMAS DURIEZ, JEAN LUC AIDER, JOSE E. WESFREID, PMMH - ESPCI (UMR 7636 ESPCI-P6-P7) — Vortex generators (VGs) are a common way to perform flow control thought their actual effect on a generic flow is mainly unknown. In order to find determinant physical parameters which can be used to optimize dimensions, position and actuation of vortex generators we have studied the effect of solid cylinder vortex generators on a flat plate boundary layer. Using two-component PIV measurement and 3D reconstruction we show the existence of a boundary layer modulation due to counter rotating streamwise vortices. By analyzing the 3D velocity field we extract the non linear part of this modulation (and especially the quadratic non linear zeroth mode) which is responsible for the mean flow modification. This parametric study gives the growth rate of non linear perturbations and the properties of the spanwise modulation depending on VGs spacing and Reynolds number. These are determinant physical parameters of the boundary layer modification by the VGs that can be used to their efficient design and control. We finally compare these results to the average modification of a separated flow over a smoothly contoured ramp by such cylinder vortex generators.

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