Abstract Submitted
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Stability analysis of the experimental and the simulated flow past miniature vortex generators in a Blasius boundary layer[1] SIMONE CAMARRI, LORENZO SICONOLFI, Università di Pisa, JENS H.M. FRANSSON, Linne Flow Centre, KTH Mechanics — It is shown in the literature that Tollmien-Schlichting (TS) waves can be damped and transition delayed if properly shaped modulations of the streamwise velocity (streaks) are generated inside a Blasius boundary layer. In [1] velocity streaks are generated experimentally by installing miniature vortex generators (MVGs) on the plate wall so as to obtain a significant streak amplitude where the uncontrolled flow would be convectively unstable. When TS waves are excited upstream with respect to the MVGs, they undergo an amplification in the near wake past the MVGs and, if the streaks amplitude is sufficiently high, they decay further downstream, delaying transition. In order to investigate this behavior, representative experimental cases among those documented in [1] are selected and simulated by DNS, and local bi-global stability analysis is applied both to the experimental and to the DNS flow fields. As a result, stability curves for the BL with MVGs are computed and compared to that of an uncontrolled Blasius BL. It is shown that available experimental results agree with the computed stability curves and results from the stability analysis are used to investigate the involved stabilization mechanisms.

[1] Shahinfar et al., Phys. Rev. Lett. 109, 074501, (2012)

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Simone Camarri
Università di Pisa

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