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Sensitivity of non-modal instabilities to base-flow modifications LUCA BRANDT, Linne FLOW Centre, KTH Mechanics, Stockholm, Sweden, JAN PRALITS, DIMEC, University of Salerno, Italy, DENIS SIPP, OLIVIER MAR-QUET, ONERA/DAFE, Meudon, France — Non-modal analysis determines the potential for energy amplification in stable flows. This is quantified in the frequency domain by the singular values of the resolvant operator and in the time domain by the singular values of the evolution operator. The present work extends previous analysis on the effect of base flow variation on flow stability by considering the sensitivity of the flow non-modal behavior. Using a variational technique, we derive an analytical expression for the gradient of the resolvent norm of the system with respect to a base flow modification and show how it depends on the optimal forcing and optimal response. The potential of such an approach is illustrated for zero-pressuregradient boundary layers where the different instability mechanisms of wall-bounded shear flows are all at work. Results confirm previous findings and clearly indicate that base flow modifications can stabilize Tollmien-Schlichting waves whereas the amplification of streamwise streaks is more difficult to hamper. This result is now explained simply examining the expression for the gradient of the resolvant norm.

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