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Model-based and adaptive laminar-flow control via dielectric-barrier-discharge plasma actuators: an experimental comparison NICOLÒ FABBIANE, Linnè FLOW Centre, KTH Mechanics, BERNHARD SIMON, SVEN GRUNDMANN, Center of Smart Interfaces, TU Darmstadt, SHERVIN BAGHERI, DAN S. HENNINGSON, Linnè FLOW Centre, KTH Mechanics — This work compares two of the mostly investigated reactive-control techniques in delaying the laminar-to-turbulence transition in boundary-layer (BL) flows: a Linear Quadratic Gaussian (LQG) regulator and a Filtered-X Least Mean Squares (FXLMS) algorithm. The two compensators are compared on damping 2D TS-waves excited via both single-frequency and white-noise disturbances in a zero-pressure-gradient BL flow. Surface hot-wire sensors are used to detect the incoming waves and measure the effectiveness of the control action that is provided by a dielectric-barrier-discharge plasma actuator positioned between the two sensors. Based on DNS of the experimental set-up a linear reduced order model is built using the Eigensystem Realization Algorithm and used for the LQG design. The two control techniques show comparable performances when tested at their design condition. However, when tested off-design the LQG compensator shows a stronger sensitivity to model variations. If the free-stream velocity is changed, the LQG regulator estimates a wrong phase information of the incoming disturbance resulting in a less effective control action. The FXLMS compensator, instead, is capable to adapt to the new condition and prescribe the correct phase information with no significant performance loss

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