Abstract Submitted
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A study of synthetic large scales in turbulent boundary layers[1]
SUBRAHMANYAM DUVVURI, MITUL LUHAR, California Institute of Technology, CASEY BARNARD, MARK SHEPLAK, University of Florida, BEVERLEY MCKEON, California Institute of Technology — Synthetic spanwise-constant spatio-temporal disturbances are excited in a turbulent boundary layer through a spatially impulsive patch of dynamic wall-roughness. The downstream flow response is studied through hot wire anemometry, pressure measurements at the wall and direct measurements of wall-shear-stress made using a novel micro-machined capacitive floating element sensor. These measurements are phase-locked to the input perturbation to recover the synthetic large-scale motion and characterize its structure and wall signature. The phase relationship between the synthetic large scale and small scale activity provides further insights into the apparent amplitude modulation effect between them, and the dynamics of wall-bounded turbulent flows in general. Results from these experiments will be discussed in the context of the critical-layer behavior revealed by the resolvent analysis of McKeon & Sharma (*J Fluid Mech*, 2010), and compared with similar earlier work by Jacobi & McKeon (*J Fluid Mech*, 2011). Model predictions are shown to be in broad agreement with experiments.

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