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The high-order statistics of APG turbulent boundary layers[1]
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— One and two-point statistics are presented from a new direct numerical simulation of an adverse pressure gradient boundary layer, at $Re_\theta = 250 - 2175$, in which the transition to turbulence is triggered by a trip wire which is modeled using the immersed boundary method. Mean velocity results in the attached turbulent region do not show log law profiles. Departure from the law of the wall occurs throughout the inner region. The production and Reynolds stress peaks move to roughly the middle of the boundary layer. The profiles of the uv correlation factor reveal that de-correlation between u and v takes place throughout the boundary layer, but especially near the wall, as the mean velocity defect increases. The non-dimensional stress ratios and quadrant analysis of uv indicate changes to the turbulence structure. The structure parameter is low, similar to equilibrium APG flows and mixing layers in the present flow and seems to be decreasing as the mean velocity defect increases. The statistics of the upper half of the APG flow show resemblance with results for a mixing layer.

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