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Turbulence structures in a strongly decelerated boundary layer[1]
AYSE G. GUNGOR, Istanbul Technical University, YVAN MACIEL, Laval University, MARK P. SIMENS, U. Politécnica Madrid — The characteristics of three-dimensional intense Reynolds shear stress structures (Qs) are presented from a direct numerical simulation of an adverse pressure gradient boundary layer at $Re_\theta = 1500 - 2175$. The intense Q2 (ejections) and Q4 (sweeps) structures separate into two groups: wall-attached and wall-detached structures. In the region where turbulent activity is maximal, between 0.2δ and 0.6δ, 94% of the structures are detached structures. In comparison to canonical wall flows, the large velocity defect turbulent boundary layers are less efficient in extracting turbulent energy from the mean flow. There is, furthermore, much less turbulence activity and less velocity coherence near the wall. Additionally, the wall-detached structures are more frequent and carry a much larger amount of Reynolds shear stress.

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