The structure of APG turbulent boundary layers[1] AYSE G. GUN-
GOR, Istanbul Technical University, YVAN MACIEL, Laval University, MARK P.
SIMENS, U. Politécnica Madrid, JULIO SORIA, Monash University — A boundary
layer under influence of a strong APG is studied using DNS. Transition to turbu-
lence is triggered using a trip wire which is modelled using the immersed bound-
ary method. The Reynolds number close to the exit of the numerical domain is
$Re_\theta = 2175$ and the shape-factor $H = 2.5$. Two dimensional two-point spatial
correlation functions are obtained in this region and close to the transition region.
C_{vu} with a reference point close to the transition region shows a flow periodicity
until $Re_\theta \approx 1600$. This periodicity is related to the shear layer instability of the
separation bubble created as a result of the APG. The C_{vv} and C_{ww} correlations
obtained far from the transition region at $Re_\theta = 2175$ and at $y/\delta = 0.4$ coincide
with results obtained for a ZPG boundary layer. Implying that the structure of the
v, w fluctuations is the same as in ZPG. However, C_{uu} indicates that the structure
of the u fluctuation in an APG boundary layer is almost twice as short as the ZPG
structures. The APG structures are also less correlated with the flow at the wall.
The near wall structure of strong APG flows is different from ZPG flows in that
streaks are much shorter or absent.

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