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Analysis Of Direct Numerical Simulation Results Of Adverse Pressure Gradient Boundary Layer Through Anisotropy Invariant Mapping And Comparison With The Rans Simulations AYSE GUL GUNGOR, Istanbul Technical University, OZAN EKIN NURAL, OZGUR ERTUNC, Ozyegin University — Purpose of this study is to analyze the direct numerical simulation data of a turbulent boundary layer subjected to strong adverse pressure gradient through anisotropy invariant mapping. RANS simulation using the Elliptic Blending Model of Manceau and Hanjolic (2002) is also conducted for the same flow case with commercial software Star-CCM+ and comparison of the results with DNS data is done. RANS simulation captures the general trends in the velocity field but, significant deviations are found when skin friction coefficients are compared. Anisotropy invariant map of Lumley and Newman (1977) and barycentric map of Banerjee et al. (2007) are used for the analysis. Invariant mapping of the DNS data has yielded that at locations away from the wall, flow is close to one component turbulence state. In the vicinity of the wall, turbulence is at two component limit which is one border of the barycentric map and as the flow evolves along the streamwise direction, it approaches to two component turbulence state. Additionally, at the locations away from the wall, turbulence approaches to two component limit. Furthermore, analysis of the invariants of the RANS simulations shows dissimilar results. In RANS simulations invariants do not approach to any of the limit states unlike the DNS.

Ozan Ekin Nural
Ozyegin University

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