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DNS of self-similar adverse pressure gradient turbulent boundary layer at incipient separation[1] JULIO SORIA, VASSILI KITSIOS, CALLUM ATKINSON, Monash University, JUAN SILLERO, GUILLEM BORRELL, Universidad Politecnica de Madrid, AYSE GUNGAR, Istanbul Technical University, JAVIER JIMENEZ, Universidad Politecnica de Madrid — A direct numerical simulation of a self-similar adverse pressure gradient turbulent boundary layer (APG-TBL) flow at incipient separation has been carried out. The maximum Reynolds number based on the momentum thickness, Re_{δ_2}, reached in this DNS is 6,500. A wall-normal far-field boundary condition to effect the desired APG that will lead to the desired self-similar flow at the verge of separation has been developed. The self-similar analysis of the mean turbulent boundary layer equations yields the necessary conditions for a self-similar mean flow to exists. These conditions are tested using the DNS APG-TBL data base. First and second order statistics of the velocity across the APG-TBL are also presented in the light of the self-similar analysis results and compared to the results of a zero pressure gradient turbulent boundary layer DNS with similar mean inflow characteristics as the APG-TBL.

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Julio Soria
Monash University

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