

Abstract Submitted
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Influence of High Freestream Turbulence on Smooth, Favorable Pressure Gradient Turbulent Boundary Layers JOSE LEBRON-BOSQUES, SHEILLA TORRES-NIEVES, BRIAN BRZEK, LUCIANO CASTILLO, Rensselaer Polytechnic Institute, RAUL BAYOAN CAL, CHARLES MENEVEAU, The Johns Hopkins University — Experiments were conducted at the Corrsin Wind Tunnel at The Johns Hopkins University to understand the effects of high freestream turbulence on a smooth, favorable pressure gradient turbulent boundary layer. Freestream turbulence ($Tu \leq 6\%$) was generated using an active grid, and values of $Re_\theta \leq 2570$ were obtained. Measurements of the streamwise and wall-normal components of the mean velocity deficit and Reynolds stresses have been performed using Laser Doppler Anemometry. It is shown that none of the existing scales are able to collapse the mean velocity profiles and strong evidence of multiple scales is observed. Furthermore, a reduction in the wake region caused a decrease in the mean velocity gradient near the edge of the boundary layer. Moreover, turbulence production will be evaluated to study if this is the cause of an increase in the Reynolds stresses. It is also found that high freestream turbulence causes the skin friction to increase due to a higher velocity gradient at the wall.

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