

Abstract Submitted  
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**The Effect of Freestream Turbulence on a Rough Surface Turbulent Boundary Layer** BRIAN BRZEK, SHEILLA TORRES-NIEVES, JOSE LEBRON-BOSQUES, Rensselaer Polytechnic Institute, RAUL CAL, CHARLES MENEVEAU, The Johns Hopkins University, LUCIANO CASTILLO, Rensselaer Polytechnic Institute — Measurements are performed in the Stanley Corrsin Wind Tunnel Facility at The Johns Hopkins University to study the effects of freestream turbulence on a rough surface turbulent boundary layer. The upstream turbulence was generated with the use of an active grid, resulting in freestream turbulence levels of 6.2 % and 5.2 %. The effects of the freestream turbulence on this rough surface, alter the mean velocity deficit profiles. The effects of freestream turbulence are identifiable in the streamwise Reynolds stress profiles throughout the entire boundary layer, but not necessarily for the wall-normal and shear stress profiles. The reduced velocity gradient reduced the production term in the streamwise Reynolds stress despite the increase in the  $\langle u^2 \rangle$  profiles. Thus, an important mechanism becomes the turbulent diffusion from the freestream turbulence as it relates to the Reynolds stress equations.

Brian Brzek  
Rensselaer Polytechnic Institute

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