

Abstract Submitted  
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**Interactions Between a Turbulent Boundary Layer and a Wind Turbine Array Part 1: Inflow Conditioning and Experiment Characterization**<sup>1</sup> JOSE LEBRON, Rensselaer Polytechnic Institute, RAUL BAYOAN CAL, The Johns Hopkins University & Portland State University, LUCIANO CASTILLO, Rensselaer Polytechnic Institute, CHARLES MENEVEAU, The Johns Hopkins University — A rough-wall turbulent boundary layer is created in a wind tunnel to replicate atmospheric turbulent boundary layer (ATBL) conditions and to study the interaction between the ATBL and an array of wind turbines. An active grid, vertical strakes and surface roughness are combined to create mean velocity and Reynolds stresses profiles that resemble those of an ATBL, as determined using thermal anemometry measurements. Wind-turbine models, scaled down 1000 times from real life length scales, use three bladed rotors with a diameter  $D = 12\text{cm}$ . Rotor blades are twisted 1.1 degrees per cm. Stereo-PIV measurements performed downstream of the wind turbine array show that the recovery of the wake occurs faster in this study than in many previous investigations, in which the incoming flow was typically less turbulent or representative of an array of wind-turbines.

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Jose Lebron  
Rensselaer Polytechnic Institute

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