

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Interactions Between a Turbulent Boundary Layer and a Wind Turbine Array: Part 2. Turbulence and Periodic Motion Analysis**<sup>1</sup> RAUL BAYOAN CAL, Johns Hopkins University / Portland State University, JOSE LEBRON, LUCIANO CASTILLO, Rensselaer Polytechnic Institute, CHARLES MENEVEAU, Johns Hopkins University — Stereo-particle image velocimetry (SPIV) measurements of flow structure in the wake of a three-by-three wind turbine (WT) array immersed in a rough-wall turbulent boundary layer are carried out. The aim of the measurements is to understand the complex interactions between the WT wakes and the boundary layer. In particular, a triple decomposition is performed separating the data into mean flow, periodic phase-averaged velocity fields, and Reynolds stresses. The 120 degree interval between blades of the three-bladed rotor is divided into 20-degree intervals and phase-locked SPIV measurements are performed. Deterministic stresses are evaluated and compared to the Reynolds stresses. Also, the effects of phase-dependent structures on the Reynolds stresses are quantified.

<sup>1</sup>Research funding provided by NSF grant CBET-0730922 and the Ford Foundation.

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Date submitted: 05 Aug 2008

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