

Abstract Submitted  
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**The Structure of the Wind Turbine Array/ Atmospheric Boundary Layer Interface** LUCIANO CASTILLO, JENSEN NEWMAN, Texas Tech University — A structure based approach is taken to describe the interface between a scaled wind turbine array in a wind tunnel and the approximate atmospheric boundary layer above it. The principle interest is to identify the various types of structures which exist here and determine 1) the domain of their existence and 2) their role in the process of extracting energy from the mean flow above the wind turbine array. These goals are achieved by computing the proper orthogonal decomposition of particle image velocimetry data collected along the centerline of the scaled wind turbine array and projecting the instantaneous field onto the most energetic modes. The analysis is carried out behind the first four turbines in the array and reveals two distinct regions based on structural differences: The near wake which is dominated by small scale turbulence and the far wake which is dominated by larger scales. It is further shown that the majority of the energy extraction is done by the larger scales in the far wake. Further, it is shown that after the first turbine, the small scale turbulence in the near wake is often less energetic than existing larger scale turbulence in the inflow.

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