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Classification of Rotor Induced Shearing Events in the Near Wake of a Wind Turbine Array Boundary Layer SARAH SMITH, BIANCA VIGGIANO, NASEEM ALI, RAUL BAYOAN CAL, Department of Mechanical and Materials Engineering, Portland State University — Flow perturbation induced by a turbine rotorimposesconsiderable turbulence and shearing effects in the near wake of a turbine, altering the efficiencyofsubsequent units within a wind farm array. Previous methods have characterized near wake vorticity of a turbine and recovery distance of various turbine array configurations. This study aims to build on previous analysis with respect to a turbine rotor within an array and develop a model to examine stress events and energy contribution in the near wake due to rotational effects. Hot wire anemometry was employed downstream of a turbine centrally located in the third row of a 3x3 array. Data considered points planar to the rotor and included simultaneous streamwise and wall-normal velocities as well as concurrent streamwise and transverse velocities. Conditional analysis of Reynolds stresses induced by the rotor agree with former near wake research, and examination of stresses in terms of streamwise and transverse velocity components depicts areas of significant rotational effects. Continued analysis includes spectral decomposition and conditional statistics to further characterize shearing events at various points considering the swept area of the rotor.

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