

Abstract Submitted
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Turbulence structures in wind turbine wake: Effects of atmospheric stratification¹ KIRAN BHAGANAGAR, University of Texas San Antonio — Turbulence structure in the wake behind full-scale horizontal-axis WT under the influence of realistic atmospheric turbulent flow conditions has been investigated using actuator-line-model based large-eddy-simulations. Wind turbine simulations have revealed that, in addition to wind shear and ABL turbulence, height-varying wind angle and low-level jets are ABL metrics that influence the structure of turbine wake. Turbulent mixing layer forms downstream of the WT, the strength and size of which decreases with increasing stability. Height dependent wind angle and turbulence are the ABL metrics influencing the lateral wake expansion. Further, ABL metrics strongly impact the evolution of tip and root vortices formed behind the rotor. Two factors play an important role in wake meandering: tip vortex merging due to the mutual inductance form of instability and the corresponding instability of the turbulent mixing layer.

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