

Abstract Submitted  
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**Proper orthogonal decomposition of a large eddy simulation during a diurnal cycle for very large wind farms** NASEEM ALI, Portland State University, GERARD CORTINA, University of Utah, NICHOLAS HAMILTON, Portland State University, MARC CALAF, University of Utah, RAL CAL, Portland State University — The structure of the turbulent flow within large wind farms under different atmospheric flow stratification (stable, unstable and neutral) and compares it to the case when there are no turbines present. Spectral analysis is further applied to the corresponding proper orthogonal modes to identify the characteristic wavenumber and be able to relate it to the actual wind farm structure and wake-to-wake interactions. The variation in the number of needed modes between the different cases decreases with increasing value of cumulative energy, which confirms that the major difference between the different study cases resides at the largest turbulent kinetic energy containing scales of each case. The POD modes show the stratification impact of the flow structure and distinguish the flow layers. The spectral analysis displays the domain size and the distance between the rotors as distinctive scales within the wind farm.

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