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Turbine layout effects on the flow structure inside an above large wind farms LEONARDO CHAMORRO, ROGER ARNDT, FOTIS SOTIROPOULOS, University of Minnesota — An understanding of the role of the wind farm layout on the vertical momentum transport above a wind farm is essential to improve energy production of the different turbines. We investigate the turbulent structure of the flow inside and above a large model wind farm (roughly in fully developed conditions). The large array of turbines consisted of several columns of turbines spaced three abreast in an aligned configuration. The length of the wind farm was over fifteen boundary layer thicknesses. Turbine spacing of 6, 8, 10 and 12 rotor diameter was considered for the analysis. Full characterization of the turbulent flow was obtained between two rows of turbines far inside the wind farms in a vertical plane parallel to the direction of the flow and two spanwise-vertical planes were also included. A cross-wire anemometer was used to obtain high resolution measurements of streamwise and vertical velocity components at various locations at 10 KHz for a sampling period of 120 s at each location. Turbulence statistics, scale-to-scale interaction and TKE budget terms are evaluated to determine the role of the turbine layout on the turbulent dynamics of the flow.

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