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Effect of nocturnal low-level jet on wind farm performance SRINIDHI NAGARADA GADDE, RICHARD STEVENS, University of Twente — Large-eddy simulations of wind farms in a quasi-stationary, nocturnal, stable boundary layer are performed to understand the effect of the low-level jets (LLJ) on the farm performance. The effect of the LLJ is studied by systematically varying the cooling rate at the surface. The height of the boundary layer decreases with the increasing cooling rate and forms a LLJ due to the frictional decoupling at the inversion layer. We find that the power production of the wind farm increases with the cooling due to the high shear in the LLJ. For strong cooling, the destruction of turbulence by buoyancy causes a drop in the vertical entrainment; consequently, the turbines in the rear of the wind farm produce less power compared to the turbines operating in a low or moderately stable boundary layers. In addition to the power production, we analyse the flow structures to better understand the wind farm-boundary layer interaction in the highly stratified atmosphere.

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