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Interactive comment on "Evaluation of tilt control for wind-turbine arrays in the atmospheric boundary layer" *by* Carlo Cossu

Anonymous Referee #1

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The paper uses Large Eddy Simulations to study the effect of rotor diameter, boundary layer height, and wind veer on power gains from tilt-misalignment in a wind farm. Several interesting insights are gained, indicating the relation between streak amplification in the boundary layer, and tilt-induced power gains. The paper is well written.

The reviewer has some minor comments/ questions:

- Line 96: The actuator disk models are simulated with a constant ratio between thrust coefficient and power coefficient. When the author choses to run wind turbines at a higher thrust coefficient, how is the power coefficient modeled? If it is modeled with the linear dependence on thrust coefficient as described in the text, the power coefficient will be unrealistically high for the case of CT'=3? It would be helpful if the author can explain in the text how the power coefficient is modeled when the thrust coefficient is

increased past CT'=2, and how a higher thrust coefficient can be practically applied in a real wind farm.

- If the power coefficient indeed increases to an unrealistically high value for CT'=3, it would mean that the power of the first row of turbines is overestimated? Maybe the author can add a plot of average row power also for the case of CT'=1.5?

- One focus of this paper is 'quantifying' or 'estimating' power gains from tilt misalignment. (see line 62) However, Large Eddy Simulations are not perfect, as small scale turbulence is missing. Subgrid scale modeling can have an effect on the turbulent diffusion of the counter rotating vortex pairs, leading to an over-estimate of the downstream dominance of the counter rotating vortex pair. Furthermore, the wind turbines are modeled by actuator disk models. It would be helpful for the reader if the author gives a brief discussion on the limitations of this study.

- Line 104: 'spanwise turbine spacing λy = 4D': It is mentioned later in the text, but it would be helpful to mention here the typical spanwise spacing for 'streak generators' as described non-dimensionally in the respective papers, instead of converted into wind turbine diameters for this specific case.

- Wind veer is relatively limited in the considered boundary layer conditions. Does the author expect a bigger impact on power improvement from tilt when wind veer would be stronger?

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