

Comment on *Investigating energy production
and wake losses of multi-gigawatt offshore
wind farms with atmospheric large-eddy
simulation*

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In this paper, by using large-eddy simulation (LES) with coarse grid, the authors examines the energy production and the wake losses of six different hypothetical wind farm, with consideration of atmospheric stability. The novelty of presented in this paper includes setting up boundary conditions by incorporating large scale tendencies from reliable reanalysis dataset and taking transport of moisture and latent heat into account, which make the study presented by the authors stands out among many similar LES studies considering dry ideal conditions only. Moreover, the authors have performed sensitivity analysis which makes their results robust. Thus I recommend publishing this paper.

Several minor or technical comments which I think may help:

- Line 33: typo: exampe -> example
- Line 102-111, section 2.2.1: The authors have talked about how model fields from ERA5 are incorporated to the LES temporally. I was wondering how did the authors spatially incorporate the coarse ERA5 data (which I think have a resolution to the order of 10 km) to the LES run with 120 m resolution. Did the authors interpolate them?
- Line 134 - 137: It seems that the authors have incorporated a simple ADM without wind farm rotation. Maybe out of scope, but I was wondering if the results will be different if rotation has been accounted for. There are several ADMs that already considered rotation maybe the authors can check those.
- Line 139: typo: manufactorer -> manufacturer
- Line 155-160: The resolution of the LES run:
 - Could the authors provide more information about the vertical grid stretching thus the vertical resolution across the rotor?

- The 120 m horizontal grid spacing (and the 60 m in the sensitivity test part later) is very interesting since it sits between the resolution of mesoscale models with wind turbine modeled (e.g. WRF with Fitch model where the resolution is in the order of 1 kilometer) and that of the wake-resolving LES (in the order of 1 meter). Since there is no resolving of the wake in this study, the coarse resolution makes sense. I was wondering apart from the observations and wind farm data, have the authors also considered comparing the results with those from mesoscale models and wake-resolving LES? This may be a worthy point in future studies.
- Line 258: Why do the authors chose 270 m and 30 m to calculate the bulk Richardson number?
- Overall comment
 - I think the authors should format the reference to the Figures in the text like Figure X a), b), c), etc. to be consistent with the sub figures in the paper. Currently they are in a format like Figure X a, b, c, ...
 - Just curious, have the authors considered seasonal variations for this year-round LES study? No LES studies so far have done that but there are other large-scale studies that focuses on seasonal changes of wind farm wake losses and production (e.g. Pryor et al. 2018, Wan et al. 2012). Maybe it will be interesting to consider seasonal effects.