Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Tempo-spatial distribution of nitrogen dioxide within and around a large-scale wind farm-a numerical case study" *by* Jingyue Mo et al.

Anonymous Referee #2

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This study presents a modeling work investigating the influence of wind farms on the spatial-temporal variation of the air pollutant. The changes in surface roughness length, and the wind turbine density (the layout of wind turbines) over the wind farm, and potential impacts on NO2 concentrations are especially considered. The impacts of wind farm on air pollution have not yet been addressed in most of previous modeling studies, so this is an interesting and scientifically valuable work, which is worthy of publication in ACP. It is clear and well written, with appropriately illustrated. I have a few, generally minor, questions, mostly with the aim to clarify some aspects of the methodology or the limitations associated with the results presented in this study.

General Comments:

1. Section 2.3, page 5, line 23: "…, we modified the geo-data in the WPS and the LANDUSEF table in WRF-Chem model." Could the author clarify and give a bit more details on what variables are modified in the model and the possible uncertainties related?

2. Section 2.4, page 7, the simulated and observed NO2 concentration are compared in Fig. S1, but how is the model performance for reproducing the meteorological fields? The information for meteorological evaluation, especially the wind speed, weed direction, and temperature should be included in the manuscripts. After considering the wind farm parameterization scheme, does the simulated NO2 concentration turn out better or worse when compared the observation?

3. The authors investigate the impacts of the wind farm on the air quality within and around the wind farm regions by a case study and find that the wind farm would lead to the accumulation of the air pollutants featured by a step change in the concentration at the "edge" of the wind farm. But in winter, I think the prevailing wind are mostly westerly wind over these regions, rather than the case in this study, could the authors give some suggestion that how do NO2 levels might change during polluted episode near city regions with the inclusion of the wind farm scheme? How large-scale wind farm may affect the NO2 levels in Jiuquan or Jiayuguan city? Since the city regions have relative high population density, and it's more worthy of concern in big city. The consequences of the changes induced by the large-scale wind farm parameterize on air quality and their implication on human health near large city should be discussed more, at least in the discussion section.

Specific Comments:

1. Organizational suggestion: the simulation runs (S1, S2, S3, S4) are described in section 2.3 currently (page 7, line 1-10), but the simulation case (simulation time, locations) is given in section 2.4. Since all the simulations were performed from November

19th to 24th, 2016, I would suggest put the paragraph (currently page 7, line 1-10) into the section 2.4.

2. In Figure 2, "40°N" should be "40°00'N", "97°E" should be "97°00'E".

3. Page 9, line 17, "control (S1) run" should be "control run(S1)"

4. Page 9, line 22-23, "(the second model scenario run minus control run)" should be "(S2 minus S1)"ãĂĆ

5. Page 10, line 15, "November 10" should be "November 19".

6. Page 10, line 16, "(the third model scenario run minus control run)" should be "(S3 minus S1)". If the simulation runs are named as S1, S2, S3, S4 in the MS, please be consistent throughout the MS.