

***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 #1

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Review of “Tempo-spatial distribution of nitrogen dioxide within and around a large-scale wind farm-a numerical case study”, by Mo et al.

This paper investigated the tempo-spatial distribution of NO₂ concentrations within and around a large-scale wind farm in Gansu, China using WRF-Chem. Adopting two parameterization schemes, the authors found that the wind farm produces an “edge effect”, where NO₂ are higher in the upwind and border region but lower within the farm and in the downwind region. This paper is well written and structured, and is valuable for evaluation of the impacts of wind farms on atmospheric transport of pollutants and air quality forecasting. I recommend publication in ACP. I have a few minor comments

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on the method and result of this study, and enlist them as the follow:

1. Why do the authors set the distance between two wind turbines to 500m and 1000m in the model scenario S3 and S4? Using the real distance between two wind turbines in the Yumen Wind Farm might be more appropriate in the simulation.
2. Why do the authors choose NO₂ as the target air pollutant? NO_x might be a better target as no chemical evolution is involved. The distribution of NO_x could characterize the impact of wind farm on atmospheric transport without the influence of chemical reactions.
3. In the validation part, only the WRF simulation without wind farm parameterization was compared with measurements. The simulations under the two wind farm parameterization schemes should also be validated against measurements to demonstrate that the two schemes could well reproduce the impact of wind farm on the wind field and pollutant distribution in the domain studied.
4. The surface roughness length parameterization treats the wind turbines as pure obstacles while the wind turbine drag force scheme considers the turbines as momentum sink of the wind flow. In reality, the wind turbine could both act as an obstacle and a sink of momentum. Therefore, the effect of wind farm on the pollutant distribution might be a combination of the two schemes to some extent.

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