Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-1180-AC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatiotemporal variability of NO_2 and $PM_{2.5}$ over Eastern China: observational and model analyses with a novel statistical method" *by* Mengyao Liu et al.

Mengyao Liu et al.

liumy_14@pku.edu.cn

Received and published: 21 June 2018

In this paper, the authors analyzed the spatial and temporal variability of ground level NO2 and PM2.5 in Oct-Dec. 2013, and evaluated model performance of GEOS-Chem and CMAQ on the spatial and temporal variability. The topic is important, the methods sound, and the results look reasonable. I suggest this manuscript be accepted as a discussion paper with some minor revision described below.

(1) The separation of SEC and NEC using Huai-River would be more appropriate, especially when considering the variability of NO2 and PM2.5 due to emissions and meteorology factors.

Our separation line is based on the EOF analysis. The line is also close to the Huaihe River line (red line in the updated Fig. 1), especially considering that few measurement stations are located between the two lines. Using the Huaihe River line does not affect our general findings regarding south-north contrast.

(2) The emissions used in GEOS-Chem and CMAQ are different and it adds more complexity to illustrate the performance difference between the two models. Better to use the same emissions to eliminate this factor, or at least to discuss how this factor contributes to the difference.

In the end of revised Sect. 4.3, we have added that "The magnitude of emission differences between the two models plays an insignificant role in the differences between their simulated NO2 or PM2.5 concentrations. Chinese anthropogenic emissions in 2010 used in GEOS-Chem (except for NOx) are close to emissions in 2013 used in CMAQ (within 10% for both gases and primary aerosols, mostly within 5%, see Zheng et al. (2018)). NOx emissions in GEOS-Chem are scaled to 2013 using satellite NO2 data, which further eliminates the differences from those used in CMAQ. The difference in the spatial distribution of emissions is also small (Geng et al., 2017; Zheng et al., 2018)."

(3) If the too thick first layer of GEOS-Chem (130m) is the main reason for model underprediction, is it possible to configure the first layer to 80m as the CMAQ model so that you can provide direct proof to support your argument?

This is a very good suggestion. In fact, we had thought about doing so. Unfortunately, the vertical resolution of GEOS-Chem is hardwired and adhered to the coordinate of inputted meteorological fields, unlike other models such as MOZART. Thus it would take much longer time to change the model coordinate than would be appropriate for this particular study. This was why we have taken the liberty to use CMAQ simulated vertical profiles to scale GEOS-Chem results, as a simplified test.

2018.

C3