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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of Coal Burning on Ambient $PM_{2.5}$ Pollution in China" *by* Qiao Ma et al.

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1. The description of the simulation is too concise for the reader to understand from the information provided if the contributions to PM2.5 from sources outside the nested domain are accounted for or not. If these contributions are accounted for, a paragraph should discuss the importance of these contributions and a Figure should show the relative importance of the sources within the domain and contrast them with outside

Response: In the nested simulation for East Asia, the contribution from outside the nested domain are accounted for. In order to quantify this contribution, we conducted another sensitivity simulation with all sources outside the domain shut off. The standard and sensitivity simulation results are shown in Fig.1 (a) and (b) in this reply, and the difference between them is analyzed as the contribution from outside the domain,

which is shown in Fig.1 (c). The maximum contribution from outside is up to 13.8 μg/m3, which mainly occurs in the west and northwest boundaries. The average contributions is 1.57 μg/m3 in the simulation domain of East Asia. Within the boundary of China, the largest contribution occurs in the Northeast, which is 7.35 μg/m3. The average contribution from outside the nested domain is only 0.3 μg/m3 within China We also add the above text and figures in the manuscript as suggested.

2. The aerosol composition used page 6 has been gathered for measurements taken from 2006-2007 in cities across China. Your study centers on the year 2013. How did you connect this composition for 2006-2007 to the year 2013?

Response: We didn't adjust the observation during 2006-2007 to connect to our simulation, but took into account the differences of emissions in 2006, 2007 and 2013, when we interpret the evaluation results. To better resolve this issue, we add the evaluation using the observation data from X. Zhang et al. (2015), which is shown in Figure 2 in this reply. The observed concentration is the average from 2012 to 2013. The information of each site is described in detail in Zhang et al. (2012). The underestimate of sulfate mainly occurs in the two cities of Zhengzhou and Xi'an, two orange spots in central and north China, as these two sites are located in urban area. Nitrate and ammonia are overestimated by around 20%, which is a common issue in most CTMs. OC is underestimated by 28.9% due to the incomplete mechanism of SOA simulation. The NME is calculated between 30% and 41%. Generally the model can reproduced the special distribution of PM2.5 speciation.

3. Concerning Figure 2, you present the maps of surface PM2.5 for four seasons and simply give the normalized mean bias and the correlation coefficient. I would like to see with Figure 2 the correlation plots so that the reader can have a better view of how the predicted PM2.5 concentrations agree/disagree with the measured ones.

Response: We made the correlation plot for each season, as shown in Fig. 3 in this reply. The PM2.5 concentration is more spread out in coordinates in winter as it varies substantially across China, which has a larger correlation coefficient of 0.71. In other seasons, the correlation coefficients are around 0.6. We also add the above text and figures in the manuscript as suggested.

4. Finally the syntax for paragraphs 4.1 through 4.4 should be improved before the manuscript is considered for publication in ACP

Response: We re-plot the figures from 4.1 to 4.4 and improved the syntax in the manuscript as suggested.

References

Zhang X Y, Wang Y Q, Niu T, et al. Atmospheric aerosol compositions in China: spatial/temporal variability, chemical signature, regional haze distribution and comparisons with global aerosols[J]. Atmospheric Chemistry and Physics, 2012, 12(2): 779-799.

Zhang X Y, Wang J Z, Wang Y Q, et al. Changes in chemical components of aerosol particles in different haze regions in China from 2006 to 2013 and contribution of meteorological factors[J]. Atmospheric Chemistry and Physics, 2015, 15(22): 12935-12952.

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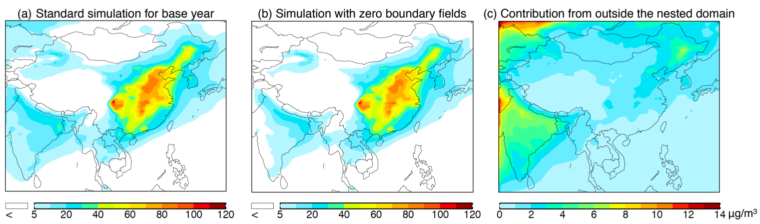

Figure 1 Contributions from outside the nested domain

Fig. 1.

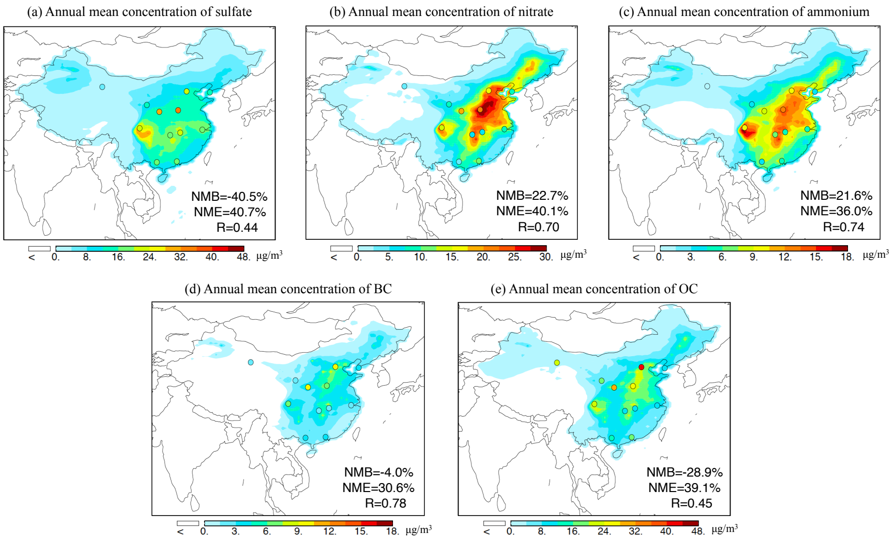

Figure 2 Comparisons of simulated $PM_{2.5}$ composition with observation averaged during 2012-2013

Fig. 2.

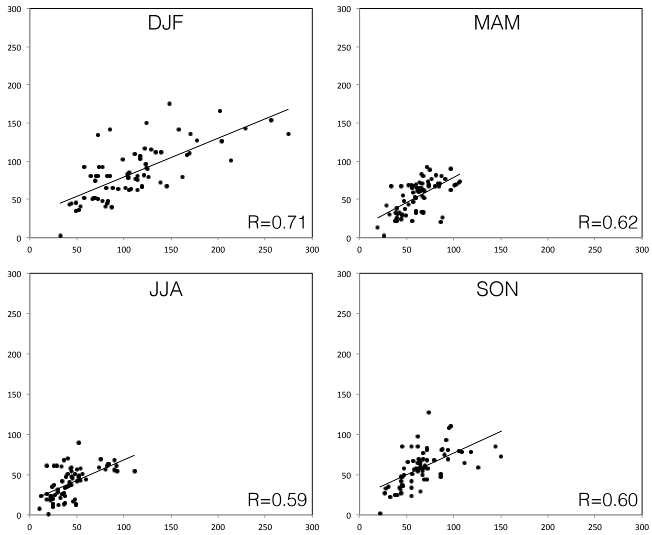

Figure 3 Correlation maps for each season

Fig. 3.