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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling study of impacts on surface ozone of regional transport and emission reductions over North China Plain in summer 2015" *by* Xiao Han et al.

Anonymous Referee #2

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In the manuscript, the air quality modeling system RAMS-CMAQ (regional atmospheric modeling system-community multiscale air quality), coupled with the ISAM (integrated source apportionment method) module is applied to investigate the O3 regional transport and source contribution features during a heavy O3 pollution episode in June 2015 over NCP. It explores that that the emission sources in Shandong and Hebei was the major contributors to O3 production in the NCP, and it found that the modeling system can provide valuable information for precisely choosing the emission sector combination to achieve better efficiency. It is meaningful. I recommend the manuscript to be accepted after some minor revisions, and detail some issues below.

Major points:

1. The modeled and observed wind directions were not in good agreement with each other, even in Jan. and Jun. How can you get the result that about 20-30% and 25-40% O3 mass burdens in Beijing and Tianjin were contributed by the emission sources in Shandong and Hebei? Whether should the author compare with the regional atmospheric circulation field?

2. In Figure 4, it seems that there are negative values in modeled hourly mass concentrations of O3 in January, how does this result happen?

3. In Figure 3, the model doesn't perform well in reproducing the observation trend of NO2. The NO2 is important precursor of O3, if the NO2 is underestimated, why dose the performance of the O3 simulation be normal?

4. Why do you choose 4μg m-3 as the threshold to present the different scene?

5. In Figure 5, there are large high values area of NOx and VOCs, but it is corresponding with the low values area of O3, especially in Beijing. What is the reason caused this phenomenon? Though the solar radiation is weak in Jan..

6. In page 225-226, "In addition to the strong emission, this observation should be the main reason for the high mass burden of NOx and VOCs in these regions." What does it mean?

7. In page 254, I don't understand the procedures of the sensitivity tests, if you reduce 30% of VOC emissions or 30% the NOx emissions within the entire model domain, respectively. It should represent the influence of VOC and NOx, respectively. Why is there the variation of the mass concentration of O3 due to the reduction in VOC and NOx emission at the same time?

8. Due to underestimate NO2, whether does it cause the results that "the urban areas and most O3 pollution regions of NCP were mainly dominated by the VOC-sensitive conditions"? And it causes "removal of the transport and power plant sectors could not

effectively reduce the O3 mass burden and even increased the mass burden in high pollution areas, such as southern Beijing, Tianjin, Tangshan, southern Hebei, Jinan, and other parts of Shandong". Because the most important source of NOx is industry, then transportation and power.

Minor points:

1. In page 204, whether the relationship is close, it doesn't only depend on the value of relationship coefficient; it also depends on whether it has passed the significance test.

2. In Figure 4, the time coordinate in Shanghai is not agreement with other cities.

3. In Table 1 and 2, if it is comparisons of hourly data between simulation and observation, why do you calculate the correlation coefficient between daily observation and simulation, rather than hourly data? What's the unit of variables? Why the number of samples in simulation and observation is different?

4. The modeled results show the NOx, why do you compare with NO2?

5. In Figure 2, it is difficult to distinguish the results in Jan. and Jun. except for temperature.

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