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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 #1

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China is facing serious air pollution with high PM2.5. Recently ozone (O3) becomes the premier pollutant in summer replacing PM2.5. This study investigates this important issue using the regional air quality modeling system RAMS-CMAQ. The ISAM module is used to track the O3 from major pollution regions for the VOC and NOx-sensitive O3. The brute-force method is used to examine the sensitivity of O3 to the reduction of precursor emission from different sectors, which can provide scientific basis for O3 mitigation strategy. This work is in general a solid contribution to understanding of O3 formation and transport at regional scales. I have the following major and minor comments on the manuscript. After the authors address my comments, I would recommend the acceptance of publication.

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Discussion paper

Major comments:

1. I would like the authors to add some discussions of the novelty of this study. In the introduction, the authors mentioned many previous studies on the similar topics. How does this study differ from previous studies?

2. it looks that the model still has obvious biases (shown in Figures 3 and 4). I would recommend the authors to add some detailed discussions on the potential factors for the model biases: emission, chemistry mechanism, physics, or model grid spacing? Is it possible to add a plot (figure) on VOC (or CO) validation of model results with observations (besides NO2 and O3 in Figures 3 and 4)?

3. The result of regional contributions of NOx- and VOC-senstivie O3 from different regions (Figures 6 and 7) is interesting. Will different regional contributions add up to be 100% at one given location (i.e., local and non-local contributions)? I would suggest to add a table to show the relative contributions to O3 in several regions (e.g., Beijing, Hebei..) from different local and non-local regions. This will give the readers the idea of O3 sources in different regions (local formation versus precursor transport).

4. Please give the reason for the non-linear change of O3: why does O3 increase in many locations when power-plant O3 precursors are removed (Figure 9j)?

Minor comments:

1. Line 66. change "play a role" to "play an important role". 2. Line 77. change "deeply analyzed" to "through analyzed" 3. Line 85, change "severe" to "strict". 4. Line 89. "The amount of surface O3 is expected to continue increasing as the particulate mass loading decreases due to the emission control strategies employed in the NCP". why? can you explain? 5. Line 103. "statistical response surface method". This is not clear. 6. Line 150. "TSSA"? 7. Line 168. "grid distance" to "grid spacing" 8. Line 225. "this observation". not clear. 9. Line 268. "Figure 7f" should be "Figure 8f".

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