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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulations of Organic Aerosol Concentrations during Springtime in the Guanzhong Basin, China" *by* Tian Feng et al.

Anonymous Referee #1

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General Comments

This manuscript presents the organic aerosol simulations in West China using WRF-Chem. Two types of SOA formation treatments are used, and the simulations are evaluated against monitoring station observations (O3 and PM2.5), campaign sampling site measurements (carbonaceous aerosols), and MODIS AOD retrievals (aerosol optical depth). The authors quantify the SOA fraction in OA and the contribution of different anthropogenic emission sources to OA at different environmental settings (urban, rural and background). The paper stands in a good form with some polishing.

Specific Comments

1. Pull together all measurement data and place in a separate sub-section in Section 2. This may make the structure flow more fluently. The measurement data should

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include those used for the model evaluation, such as from the monitoring stations, the field campaign sites, and the MODIS AOD retrievals. Instrumentation for the OA and EC filter field measurements should be described.

2. Add a table summarizing the source-categorized anthropogenic emission in Xi'an and its surroundings in Section 2. This may facilitate the discussions on the OA source apportionment in Section 3.2.4.

3. Clarify Section 3.2. It is not clear to me why certain values of OC/EC and OA/OC ratios are used and how "measured" POA and SOA values are derived in this study. To derive the POA and SOA concentrations from the OA and EC measurements, you need to have the values for the POC/EC, SOC/EC, POA/POC, and SOA/SOC, but in the description there is no presumed value for the SOC/EC ratio. Also please justify the uses of the values of POC/EC (2.4), POA/POC (1.2), and SOA/SOC(1.6), and you may also address that these values may affect the model-measurement comparisons. In addition, it would be interesting to compare the assumed POA/EC and SOA/EC ratios with the simulated counterparts.

4. In the end of Page 15, you rightly point out that "future studies need to be performed to further improve SOA simulations and OA source apportionment". There are many factors contributing to the OA, SOA in particular, simulation uncertainties, including measurements, meteorology, emissions, and SOA formation mechanisms and treatments; even right modeling results might be due to wrong reasons (i.g., right concentrations but wrong O/C ratios). Elaborating a little bit more on what aspects of the SOA modeling can be improved would be insightful.

5. In Section 3.2.4 and Table 2, you may add the OA/PM2.5 fractions, which may provide more scientific information for devising the haze control strategy, since OA is only one important component of the haze in the GZB.

6. P3, lines 65-67. For the upper limit fractions, SOA/PM2.5 has a higher value (77%) than SOA/OA does (71%)? Specify the investigation region in the Sun et al. (2012)

study.

7. Line 85, start a new paragraph from “During the period from 20. . .”.

8. Ls 200-202, the morning elevation could also contributed by the morning rush hour emissions. What do the PM2.5 diurnal profiles look like?

9. Ls 224-232, describe how AOD is estimated in the model.

10. Ls 254-257, conflicting. The difference between 33.6% in T2-SOA and 4.3% in NT-SOA is not “not remarkable”.

11. Ls 286 -303, Discussions on the SOA/OA fractions in the two paragraphs overlap, and can be merge them.

12. Ls 331-333, the emission source is one reason; another one can be due to the rapid transport and transformation processes.

13. Ls 341-342, Model results are compared not only against O3 and PM2.5 from the monitoring stations, but also against the PM2.5 carbonaceous components from the OC and EC field filter measurements, and against the MODIS AOD.

14. Page 24 Figure 1 caption, describe the black “circle” (urban borderline?).

Technical comments

1. Line 175, pollution

2. Line 183, concentrations substantially increase to

3. Line 195, delete well

4. Line 198, the air quality with respect to PM2.5

5. L275-276, change to something like “Since the NT-SOA module significantly improves the POA and SOA simulations, we will use the NT-SOA OA simulations for further comparisons and the OA source apportioning. Figure 11. . .”

6. 310, verify to estimate

7. Line 324, emissions are

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