Atmos. Chem. Phys. Discuss., 15, C1531–C1533, 2015
www.atmos-chem-phys-discuss.net/15/C1531/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formation of secondary organic aerosol in the Paris pollution plume and its impact on surrounding regions" *by* Q. J. Zhang et al.

Anonymous Referee #1

Received and published: 13 April 2015

This article uses the regional model CHIMERE to understand sources of organic aerosol downwind of Paris during the MEGAPOLI project. The aircraft data sets provides a valuable opportunity to evaluate the model as it captures processing of the Paris plume. The paper should be published after addressing a few items.

In contrast to other work (such as Hayes et al. 2014 ACPD for Los Angeles or Hodzic et al. 2010 for Mexico City) the authors find that traditional SOA precursors (biogenic and anthropogenic) contribute more to SOA than S/IVOCs. It would be useful if the authors could present more discussion on why the results are different in this study. Would the conclusions be different if traditional SOA systems were not aged? How confidant are

the authors in the estimate of S/IVOC emissions? Is the O/C ratio faithfully reproduced?

Other comments:

1. Reword last sentence of abstract for greater clarity.

2. In abstract, more clearly state the predicted role of VOC vs. S-IVOC precursors. "anthropogenic precursors" encompasses both. Also highlight that biogenic SOA is predicted to be the largest contributor.

3. Figure 1: why are aircraft data shown as more of a "point" or range while the ground data is shown as a bar?

4. Table 4: Indicate that the correlations are with the OA,Ox pairs listed at the top. (It reads like the correlations are for OA/Ox and some other quantity). Relabel OPOA SI-SOA. Could POA be added for reference?

5. Figure 6: ASOA (and BSOA) seems to have two OA/Ox regimes. Is there a reason?

6. Page 8075, line3, indicate "they" more clearly

7. Why was the 30th percentile chosen for background (vs. 5th or some other value)?

8. What is the observed contribution of HOA to total OA? How does including HOA/POA influence the OA/Ox slopes compared to looking at only SOA or OOA/Ox?

9. Page 8081, give a few brief details on the S/IVOC implementation (such as how emissions were determined).

10. Page 8083, the LNOX simulation underestimates background OA to a greater degree than HNOx despite having higher yields. Why does that occur?

11. Page 8084, line 9, I don't think you mean you will "investigate the relative contribution of OA to Ox."

12. Figure 6, In all cases, the model overestimates the observed OA/Ox slope. On the 21st and to a lesser degree on the 29th, that result seems to be driven by a large

contribution of biogenic SOA. Is biogenic SOA enhanced in the plume?

13. Can you calculate the RO2 radical fate to determine the relative importance of high vs low-NOx pathways in the observations?

14. Why wasn't the RO2 radical fate diagnosed in the model and the appropriate high or low NOx yield used? Even if the plume is dominated by RO2+NO, the background aerosol may not be.

15. Page 8085, lines 21-25 sentence could be clearer.

16. Figure 7,8: captions indicate LNOx results are also shown, but are not included.

17. Are the intercepts of the OA/Ox regressions fixed?

18. Did the authors look at OA/CO ratios for additional insight?

References:

1. Hayes et al. 2014 ACPD: http://www.atmos-chem-phys-discuss.net/14/32325/2014/acpd-14-32325-2014.html

2. Hodzic et al. 2010 ACP: http://www.atmos-chem-phys.net/10/5491/2010/acp-10-5491-2010.html

---

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 8073, 2015.