Atmos. Chem. Phys. Discuss., 14, C6237–C6239, 2014
www.atmos-chem-phys-discuss.net/14/C6237/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Multiday production of condensing organic aerosol mass in urban and forest outflow" *by* J. Lee-Taylor et al.

Anonymous Referee #2

Received and published: 27 August 2014

In this manuscript, the authors studied secondary organic aerosol (SOA) production in urban and forest outflows using the explicit gas-phase chemical mechanism generator GECKO-A. Their simulations show several-fold increases in SOA mass continuing for several days in the urban outflow while the SOA mass increase in the forest outflow is more modest (∼50 %) and of shorter duration (1–2 days). The GECKO-A model treats millions of reactions and species. While the present work relies on box model simulations with many assumptions and approximations, the detailed simulations provide useful insights about the SOA production from multi-day multi-generational reactions. For example, it was shown that the production in the urban outflow can be attributed to multi-generational reaction products of both aromatics and alkanes. This work emphasizes the importance of considering these anthropogenic-origin SOA in regional

and global aerosol models. The content of this manuscript is suitable for ACP and the manuscript is well written. I can recommend the publication of this manuscript in ACP after the following comments are properly addressed.

1. The explicit GECKO-A model is computationally very expensive. Based on the detailed information from GECKO-A simulations, can the authors provide some simplified schemes that can be used in regional or global models? In Section 4, the authors briefly mentioned that only a few species classes contribute a large proportion of the predicted mass production. It will be very helpful if specific and practical suggestions can be provided on how to represent such processes in 3-D models.

2. The production of SOA in urban plumes has been studied in LT11. The additional formation of SOA during the urban plume dilution, which has already been pointed out in LT11, is a main focus of present study. In page 18004, the authors mentioned the modifications made to LT11. What are major new findings of the present study (compared to LT11)?

3. How were the photochemistry and diurnal variations of key oxidants represented in the box model simulations? How sensitive are the results to these? It will be useful it the authors can provide a figure showing the values and variations of key oxidants.

4. It would be helpful if the authors could provide time series (either in tables or figures) of dilution corrected gas and particle phase carbon mass as well as net loss for species of different carbon numbers or ranges of carbon numbers (4-9, 10-15, 16-22, 23-30, etc.).

5. Page 18005, lines 1-5. These simplifications may be far from what happen in the real atmosphere. The authors should discuss the potential impacts of these approximations to the conclusions.

6. Page 18008, line 3. Why do not use a more realistic diurnally variable temperature?

7. Page 18011, line 1. It appears from Fig 2b "20%" should be ∼ "30%".

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 17999, 2014.