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Atmospheric
Chemistry
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Discussions

Interactive comment on "Dependence of SOA oxidation on organic aerosol mass concentration and OH exposure: experimental PAM chamber studies" *by* E. Kang et al.

Anonymous Referee #1

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This paper examines the changes in composition that result from exposing VOCs (and the SOA produced upon oxidation) to a highly oxidizing environment in a PAM chamber. It is compelling that to see that the degree of oxidation of OA in the PAM chamber spans lab and field measurements. The manuscript is very clear and well written.

My only major concern is that these results be properly qualified, particularly when these results are compared to other lab/field studies. The PAM chamber represents a very different kind of oxidizing environment from the ambient atmosphere – differences in chemical products as well as kinetics could limit whether this chamber is a suitable proxy for the atmosphere. In some ways, this study represents a first step

in the direction of examining whether the PAM chamber represents realistic processing. I would encourage the authors to be realistic when making comparisons – there are many reasons that the PAM chamber environment could produce different results from atmospheric conditions. A discussion of these in Section 3.4 would be very interesting/helpful for the community. The authors primarily focused on differences in AMS analysis and wall-effects (which of course can also contribute). It would be ideal to see some evidence of the scaling of chemical effects with exposure time (same overall OH exposure). Could the authors make a first step in this direction by decreasing/increasing the flow rate and the OH concentrations to maintain the overall OH exposure but slow/speed the system? It appears from Kang et al., 2007 that experiments at different flow rates have been performed in the past.

Otherwise, I have only minor suggestions for improvement, primarily related to phrasing. Once these comments are addressed, I recommend that the article be published in ACP.

Minor comments

1. Abstract, Line 5: one can question whether oxidation in the PAM chamber "is equivalent" to atmospheric oxidation of longer duration, given potential differences in chemistry. I suggest modifying this phrasing to "approximates" or something similarly qualified.

2. Abstract, Line 16: This statement is poorly worded. Do you mean "the least oxidized OA" from this study or from the environmental chambers?

3. Page 24055, line 12-13: This sentence is a little misleading in that it suggests that "with further oxidation" the only fate of organics is fragmentation. But not everything goes to CO_2! Clearly organics can also functionalize with oxidation. And even for the most non-volatile (highly functionalized) organics, much of the organic material will deposit out of the atmosphere before fragmentation occurs. This is also a little unclear in the second paragraph of Section 3.3

4. Page 24056, line 6: suggest the qualification of “unmeasured precursor VOCs” – clearly only those VOCs which lead to SOA formation are relevant. Also in this sentence, can you clarify whether “measurement errors” applies to ambient or lab (or presumably both)?

5. Page 24066, line 10: This is a detail but Fig 6b of Ng et al. shows a number of points above f44 of 0.15 (equivalent to O:C of 0.6+). I would revise your 0.5 number to 0.6

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24053, 2010.