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Atmospheric Measurement Techniques Discussions

Interactive comment on "A portable dual smog chamber system for atmospheric aerosol field studies" *by* Christos Kaltsonoudis et al.

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(1) *Line 105. Six panels with 36 UV lights are used to allow photo-oxidation experiments resulting in a J_{NO2} of 0.1 min^{-1}. How does this number compare with other indoor chambers? I think it would be useful for readers if a UV-Vis spectrum of the lamps would be added as a figure.*

The J_{NO2} in indoor atmospheric simulation chambers covers a wide range from zero (several metal chambers do not have lights) to as much as around 1 min^{-1}. We have added the corresponding information in the revised paper. We have added a spectrum of the lamps in the Supplementary information. It peaks in the 350-400 nm region.

(2) *Line 128. A compressor is used to provide clean air and an activated carbon and silica gel denuders are used to purify the compressed air before introduction into the chamber. How efficient were these denuders to remove O_3 and VOCs? Is NOx efficiently removed by this set up?*

Please note that the compressor and air cleaning system is not used for the actual experiments. In these experiments the chambers are filled with ambient air without the use of cleaning devices. The compressor/cleaning system is used for the cleaning of the chambers between experiments and for blank or other chamber characterization experiments. This is now clarified in the paper.

Typically, the concentrations of ozone, NOx and larger VOCs values are below or close to the detection limit in the chambers when they are filled with clean air from our system. The scrubbers were replaced regularly and the residence time inside them was kept as high as possible (maintaining the corresponding flow rates as low as possible). The concentrations of some of the small oxygenated VOCs such as acetone, acetic acid and methanol were slightly elevated compared to the cylinder zero air. The above information has been added to the revised manuscript.

(3) *Line 185. Please describe the meaning of the "theta angle", which is used several times in the paper, for the non-specialist reader.*

The theta angle is a measure of the similarity of the OA spectra (similar to the often used R^2). It treats each mass spectrum as a vector (each m/z is an element of the vector) and expresses the angle between two such spectra. We prefer to use theta angle for AMS spectra comparisons because it can distinguish small differences that the coefficient of determination cannot. The above explanation has been added to the revised manuscript.

(4) *Line 193. Are the significant losses of particles < 80 nm mainly occurring in the pump? How long is the tubing from the inlet to the chambers?*

The length of the tubing is approximately one meter (with a 0.5-inch diameter). The estimated losses for this tube for the flow rates used and for particles in the 20-80 nm size range are 1-3 percent. Therefore, most of the losses are indeed due to the pump. The above information has been added to the revised manuscript.

(5) *Line 216. Why was the particle loss rate constant over the measured particles sizes in the lab experiments but shows a strong size dependence in field experiments?*

During the field deployment of the chambers the induced friction of the walls and the handling resulted in higher charges on the chambers walls resulting in higher particle wall losses. On the other hand, when the chambers were inside the lab, there was no build-up of charges and the losses were lower. We have recently presented a detailed analysis of the losses of particles in our Teflon chambers (both the laboratory and the field ones) in Wang et al. (2018). A brief summary of these results and the corresponding reference have been added.

(6) *Figure 5. This control experiment demonstrates that an entirely deflated chamber caused larger wall losses of particles. Does this result affect the standard field operation of the chambers? Are they transported to the field partially inflated?*

The high particle wall losses introduce uncertainty in the results, because the wall-loss corrections dominate the corrected concentration values. If the losses are very high, the maximum duration of such experiments may be limited. We have been working on developing methods to minimize these effects. Moving the chambers to the field site either fully or at least partially inflated inside our mobile laboratory clearly helps. We have also been exploring other means of reducing these surface changes in the field. A brief discussion of this topic has been added.

(7) *Figure 9 and 10. I recognize that this is a chamber characterization paper but it would be nice if the authors could add a few more thoughts on the interpretation of*

the measurements they present in figures 9 and 10. How significant are the changes observed? How do these changes compare to organic aerosol evolution in the ambient atmosphere or with "normal" SOA chamber experiments?

We have followed the reviewer's suggestion and added some more discussion about the measurements shown in these two figures. The results of several such ambient air experiments with detailed analysis of the formed aerosol, comparison with ambient and laboratory measurements are included in a forthcoming publication.

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