Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-198-RC2, 2017

Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurement of interferences associated with the detection of the hydroperoxy radical in the atmosphere using laser-induced fluorescence" *by* Michelle M. Lew et al.

Anonymous Referee #1

Received and published: 30 September 2017

This paper focuses on the characterization of the RO2-originated interference in the HO2 signal measured with the LIF-FAGE instrument from the Indiana University. This interference was shown to affect LIF-FAGE instruments from several groups (Fuchs et al., 2011;Whalley et al., 2013) in a different amount connected to the geometry of the detection cell, the methodology of the NO injection and the sample flow. These together determine the concentration and the mixing of the NO in the cell and affect the conversion of RO2 into HO2. In this study, several VOCs, relevant for the different campaigns in which the instrument was deployed, were tested and the impact on the

Printer-friendly version

Discussion paper

MCMA-2006 campaign was evaluated.

The paper is well written and the results are well presented. Publication is recommended after the authors address the following points:

1- It is not clear why it was not possible to replicate the exact same NO flow observed during the MCMA-2006 campaign. The authors say that the flow of NO during the test was kept at 1 sccm as this was the flow during all the campaigns (page 8 and 9) although saying that in reality the flow during the MCMA-2006 campaign was changed and a larger flow of NO could (reasonably) explain the discrepancy in the HO2 to OH conversion efficiency observed. Is it not possible to actually operate at the NO flow used during the MCMA-3006 campaign? How different was the NO flow? As this discussion focus on the MCMA-2006 campaign a better characterization of the interference impact for this campaign would be beneficial.

2- The use of RACM to compare with previous results is interesting although, as there is now the availability of RACM2 (which should be an improved version of RACM) and as the authors do mention that the discrepancy between the model results and the measured HO2* could be due to the different treatment of dycarbonyl species, a model run using the more update RACM2 should be performed. It would be an interesting add up to this work and could help understanding the reasons of the discrepancy between model results and measured data.

Minor comments:

Page 4, lines 16 and 20. The laser was changed between the campaigns and the laboratory tests although the name given for the new laser model is the same as for the old laser model. What is the difference then?

Page 5, line 4. Is there any improvement in injecting NO so far from the detection cell? As far as the reviewer is aware most of the other LIF-FAGE instrument inject the NO immediately on the top of the detection cell also to reduce the losses of OH radicals.

Page 7, line 15. It could be helpful to rename COH+VOC in COH→RO2 for consistency with all the other conversion efficiency.

Page 9, line 16. Please, state in the summary table 2 the number of experiments performed for each VOC.

Page 10, lines 10 to 16. It is interesting to observe such a different result from what observed previously by Fuchs et al. (2011). It would be beneficial to extend the discussion a little bit. Why the authors think there is this discrepancy? Is the same type of mercury lamp used by both groups? Could it be possible that the signal observed arises from impurities present in the VOC samples? How much is the HO2 signal due to the photolysis of the VOC?

Page 10, lines 24 to 31. Also here it could be beneficial to extend the discussion. Do the authors have any hypothesis of what could be impacting the conversion of RO2 to HO2 in addition to the points already mentioned?

Page 13, line 15 to 16. The term contrast in this case is misleading. As the authors underling later in the text, the two campaigns are characterized by different VOCs load (one is a forest environment, the other is a city) therefore it is not unexpected to observe a different amount of interference. The sentence should be rephrased. A small paragraph underlying the main chemical conditions for the three campaigns discussed in this work should be add to help the reader understanding similarity and differences between the environments.

Page 22, Table 1. Use Pascal instead of Torr. Remove the inches unit.

Page 27, Figure 4. I suggest grouping the RO2 and use of a more easily understandable labels.

Page 28, Figure 5. The colors of the plot are not easy to separate, I suggest changing the colors.

References:

Fuchs, H., Bohn, B., Hofzumahaus, A., Holland, F., Lu, K. D., Nehr, S., Rohrer, F., and Wahner, A.: Detection of HO2 by laser-induced fluorescence: calibration and interferences from RO2 radicals, Atmos. Meas. Tech., 4, 1209-1225, 10.5194/amt-4-1209-2011, 2011.

Whalley, L. K., Blitz, M. A., Desservettaz, M., Seakins, P. W., and Heard, D. E.: Reporting the sensitivity of laser-induced fluorescence instruments used for HO2 detection to an interference from RO2 radicals and introducing a novel approach that enables HO2 and certain RO2 types to be selectively measured, Atmos. Meas. Tech., 6, 3425-3440, 10.5194/amt-6-3425-2013, 2013.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-198, 2017.

Printer-friendly version

Discussion paper