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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Peroxy radical partitioning during the AMMA radical intercomparison exercise" *by* M. D. Andrés-Hernández et al.

Anonymous Referee #1

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General comments.

The article presents the measurements of the peroxy radicals, RO2 and HO2, over West Africa during WAM. These data may be significant for the understanding of photochemistry under conditions of African Monsoon. Hence, the article is definitely in the scope of the ACP. To be useful for the analysis of the related atmospheric processes it is necessary to have a clear understanding of the peroxy radical measurements' accuracy and uncertainties. In this respect the presented results are of a great interest because the measurements using two different chemical amplifier instruments are presented. As a significant disagreement between these measurements has been ob-

served, the analysis of these intercomparison data may provide information important for the estimation of the present uncertainties associated with airborne implementation of the PERCA technique. However, the description of the instruments and of their calibration/characterisation procedures presented in the article, as well as the presented discussion of the observed discrepancy, does not allow to make any clear conclusions about the instrument's performance and about the source of the discrepancy. It is desirable, that in the final version of the article the authors provide more clear and detailed explanation/discussion of the observed disagreement between the two instruments.

I) Instruments' description

To make any sense of the presented intercomparison measurements, a clear description of the main instrument characteristics should be presented. While the description of the DUALER can be found in the literature, the description of the PERCA IV is not available. (In the cited article of Green et al., 2006 only ground based instrument is described, while the PhD thesis of D. Brookes with a description of the instrument characterisation is not easily available.)

I.1) Provide the description of the airborne version of the PERCA IV instrument including the inlet and reactors characteristics, inlet flow rates, conditions in the reactor during the flight, concentrations of reactants, etc.. Also, describe briefly calibration procedure accounting for the dependence of the instrument performance (CL, NO2 detector, inlet losses, . . .) on pressure and temperature.

II) Dependence on humidity.

II.1) It is claimed that the observed discrepancy is explained by the problems related to the humidity correction. Provide the graph showing the temperature, humidity and corrections under these conditions during the flight.

DUALER II.2) It is stated that the humidity correction was not important for the DUALER. Please be more specific and give the value of the correction under the flight

conditions. Have you measured the dependence of the DUALER CL on the humidity at low temperature? Can you estimate the temperature in the reactor? If the humidity dependence is due to the HNO3 formation in the reaction of HO2 with NO, the effect can be more important at low temperature. The influence of the humidity can not be neglected on the basis of the arguments given in the article.

PERCA IV

II.3) Agreement with the model (Fig.6) is better for the BAE data with applied humidity correction. Explain why you consider that the correction results in "unrealistically" high RO2.

II.4) The arguments based on the comparison of the model and measurements are not convincing. According to Fig.2, the correction factor was approximately the same for all the data set. So, how could any trend between the humidity (apparently unchanged during the flight) and the model to measurements ratio be observed? Please present a Figure showing the humidity, temperature and the model to measurements ratio.

II.5) Concerning condensation / icing on the sample inlet. Be more specific. Under which conditions do you expect these effects to be important? What was the temperature and humidity during the flight? It seems that the relative humidity was around 50% during the flight at lower altitude. Why would you expect the condensation to take place under these conditions? Can you present examples of measurements at high altitude (6km) at lower humidity when the icing was not important? This would support the hypothesis about the importance of the icing.

II.6) Present any experimental, if available, or estimated influence of the condensation on the change of the humidity in the reactor.

II.7) Finally, if the calibration of the instruments under conditions of the flight pressures and temperatures is available it should be applied to both instruments and than the data should be compared. Otherwise, one may conclude that the presented data are

not reliable and that either such calibration measurements should be performed, or an in situ calibration should be used.

III) Comparison with the model.

As it stated many times by the authors, the main focus of the article is on "the analysis of the uncertainties of experimental data rather than on the comparison with model results". However, since such comparison is extensively presented in the article, it would be appropriate to present also some kind of a clear conclusion related to "the analysis of the uncertainties". On the basis of Fig.6, 7 and 9 the model does not only not reproduce the absolute concentrations and variability of the RO2 and HO2 radicals, but also fails to predict the profiles of other species (e.g. HCHO on Fig.9).

IV) Conclusion

Conclusion a): see the comment II.6)

Some minor comments:

Section 4.3: Provide reference to "Brookes (2010)"

Fig.4: Provide a description for the data presented on Fig.4-3 by the blue line;

Fig.9, "The model data are constrained as in Fig.6 and 7": The model constrains where different for the model 6 and 7. Also, the model used for the Fig.9 is not constrained by the HCHO data. Please correct.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 8447, 2010.