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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Nighttime measurements of HO_x during the RONOCO project and analysis of the sources of HO_2" *by* H. M. Walker et al.

Anonymous Referee #2

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Walker et al present nighttime measurements of NO3 and HO2 during aircraft campaigns over the UK and on occasion observe close correlation between these radicals. Their analysis indicates that both NO3 and O3 reactions with alkenes are important for production of HOx and that nighttime oxidation in the summer proceeds at a faster rate than daytime oxidation in the winter. The manuscript is suitable for publication following minor corrections.

P2999 L21 The oxidising capacity of the atmosphere is described as its "ability" to remove trace gases. While capacity is a physical and quantifiable characteristic of a system, ability is not. Please reword.

P3008 L23-26 Why were equal concentrations of HO2 and RO2 used to constrain the

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model ? The sentence “the model was run until the model interference ..... matched the interference measured in the interference experiments” is clumsy. Please re-word and state how the model was tuned to get it to match.

P3008 L28 “interference measurements described above”. There is no description of the so-called interference experiments, only a citation to Whalley.

P3009 L14 After describing the corrections for HO2 and deriving alkene dependent correction factors for the HO2 measurements the authors then state that the correction (on average 14 %) was not made If they trust the correction, they should apply it to the data.

P3011 L10 Wall losses of NO3 and N2O5 were determined prior to and after each flight. What was the variability in this parameter and how large the correction factor ? The total uncertainty in the NO3 measurement is given as 11 %. This seems too low, especially considering that the NO3-transmission of the aircraft inlet is unknown.

P3015 L17 Is the value of 0.6 (equation5) valid for all VOCs ? The authors should consider giving some examples of F_RO for a few different alkenes.

P3017 L24 “the seasonal difference in NO3 concentrations may have been the result of lower temperatures.” As the temperatures, the equilibrium constants and NO2 levels are known this statement can be confirmed and quantified.

P3021. The authors calculate the rate of HO2 production assuming that the losses of NO3 are completely accounted for by the alkenes measured. Based on this assumption, the authors should also be a able to calculate the steady-state mixing ratios of NO3 as the production term (via O3 and NO2) is known. They will find that the NO3 concentrations calculated this way are too high as the true overall loss rate is actually not known.

Indeed on page 3023 the authors show that the model used also over-predicts NO3. The authors then state that the discrepancy between modelled and measured NO3

ACPD
15, C299–C301, 2015

helps to explain the model overprediction of the role of NO3 in HO2 generation. I'm not sure if this is correct. If the model does not account for the losses of NO3 with hydrocarbons that were not measured it will generate more N2O5 (as the model NO3 lifetime increases) and thus underestimate the rate of oxidation of VOCs by NO3 and thus also UNDERpredict the rate of RO2 production.

P3023 L15. Data from flight B537 were excluded owing to atypical observations of HO2 , NO3 O3 and "other chemical species". What does atypical mean ? Sometimes "atypical" events can be a better test of our understanding of chemical processes than analysis of only the data that we a priori expect to find.

P3026 L 29 "and others" is not a useful reference.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 2997, 2015.