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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Nitrate radicals and biogenic volatile organic compounds: oxidation, mechanisms and organic aerosol" *by* N. L. Ng et al.

Anonymous Referee #2

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Nitrate radicals and biogenic volatile organic compounds: oxidation, mechanisms and organic aerosol

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N.L. Ng et al.

The manuscript by Ng et al. provides an overview of NO3-BVOC chemistry in the atmosphere, and how this impacts atmospheric aerosols. The review has stemmed from a workshop on NO3-BVOC chemistry, and provides a review of recent laboratory studies of kinetics and reaction mechanisms, field measurements/techniques, leading to a series of recommendations for future work. However, the manuscript provides little by

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way of critical review, and, perhaps owing to the comprehensive nature of the review, in several places lacks the detail required for a tutorial-style review. For example, the rate coefficients for NO3+BVOC reactions determined in previous experimental work are listed in Table 1, and in many cases, the rate coefficients have already been reviewed by IUPAC, with no new recommendations/review of the data. It is not entirely clear what is gained by the inclusion of these data in this review. Similarly, there is little information regarding the mechanisms of NO3-BVOC chemistry – some figures displaying mechanisms for some reactions/models at least may be helpful to aid comparison. In addition, the overview of experimental techniques used to measure NO3 (and N2O5) in the atmosphere is covered in greater depth in the 2012 review by Brown & Stutz, with little/no new insights presented here.

While the review does cover areas of interest to many atmospheric scientists, it does read somewhat as a summary of presentations at a meeting/workshop covering a broad range of topics, with the detail regarding each of the topics to be found elsewhere.

In general, the tables are poorly formatted and difficult to read. It may be helpful to remove the references and list them numerically with a list of numerical references in supplementary information (similar to the style adopted for Figure 2 perhaps). Numerous acronyms are used without definition. This review may be particularly useful to graduate students and researchers new to the area, and definitions should be provided at the point of first use to aid those researchers. A glossary would also be helpful.

Minor comments:

Page 3, line 24: Terms such as ‘enormous’ should be avoided, quantify the statement or at least provide a relative comparison to anthropogenic emissions.

Page 4, line 6: Should this be ‘alkenes’? The reactions of NO3 with alkanes are very slow.

Page 7, lines 17-19: Are the two statements regarding isoprene rate coefficients contradictory? If the results from different studies for isoprene differ by over a factor of two, how is the IUPAC recommendation precise?

Page 16, line 4: '. . . was investigated in the context of. . .', perhaps a brief discussion of the results of this investigation?

Page 16, ;one 8: 'at conditions' to 'under conditions'.

Page 16, line 11: '. . . fairly constant. . .', please quantify.

Page 16, line 27: 'reaction' to 'reactions'.

Page 17, line 18: '. . . observed a tight correlation. . .', provide the correlation coefficient.

Page 17, line 21: Remove 'the' in '. . . the nucleation and . . .'.

Page 20, line 18-19: 'Our present understanding. . .', please provide a reference.

Page 21, line 20: Please clarify the term 'oxidized once', what does this mean? A single oxidation step?

Page 21, line 26: '. . . effectively limit rate. . .' to '. . . effectively limit the rate. . .'.

Page 22, line 1: 'a phase transition' or 'phase transitions'.

Page 23, line 23: lower case 'u' in undec-10-ene-1-thiol.

Page 25, line 11: Provide a definition for 'SOx-'.

Page 25, line 14: Perhaps 'in situ' in place of 'instantaneous'?

Page 25, line 30: Can the rate coefficients used in CAPRAM be linked to those recommended by IUPAC?

Page 27, line 10: 'similar rate constants'.

Page 27, line 11: 'well correlated', provide the correlation coefficients.

Page 29, line 13: How long is ‘long path’, the 5 km referred to above?

Page 30, line 3: Perhaps worth noting that a single wavelength measurement is more difficult to identify potential interferences?

Page 31, line 2: Please provide some information regarding the ‘Langley-Plot method’.

Page 32, line 11: Note that DOAS is also an absolute technique.

Page 33, line 17: Quantify the statement ‘less good’.

Page 40, line 6: What was the integration time associated with the 6 ppt detection limit?

Page 44, line 1: Superscript in R^2, note that ‘R’ has been quoted elsewhere, it would be good to maintain consistency throughout.

Page 46, line 6: ‘K-puszta’ to ‘Puszta’?

Page 46, line 29: Why not maintain consistency and use either LO-OOA or SV-OOA throughout?

Page 48, line 15: Please briefly outline the potential fates of RO2 radicals and how these each impact nitrate formation and the nitrate yield.

Page 48, line 31: ‘k’ in italics.

Page 48, line 33: Multiplication symbol in equation rather than letter ‘x’ (and in following equations). Units for these equations should be presented in a consistent way with those elsewhere in the manuscript (e.g. in Table 1).

Page 60, line 3: ‘the SOAS campaign’.

Page 60, line 4: Remove the brackets around the reference.

Page 66, line 12: Inconsistency between ‘modeling’ and ‘modelling’ throughout the manuscript.

Page 76, line 22: Space in ‘BVOCchemistry’.

References: Chemical symbols – some use subscripts, others don't, while some display markup language formatting instructions (e.g. page 92, line 25 onwards).

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