

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

Anonymous Referee #1

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1) General Comments The manuscript acp-2016-734 submitted by Ng et al. presents a critical and extensive review on nighttime chemistry derived from the workshop held in Georgia Institute of Technology past June. The paper includes the state-of-the-art on the reactivity of NO₃ radical with BVOC both in gas and condense phases, the mechanisms of gaseous products and particulate matter formation in the reactions reviewed, and secondary organic aerosol yields from them. It also makes a revision of the instrumental techniques employed in the detection of NO₃, organic nitrates and particulate matter. A compilation of the recent field measurements of NO₃ and BVOC is presented as well, together with a synthesized description of the air quality models that try to interpret the observations in the atmosphere. Finally, the last section about

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future perspectives is a good indication that there are still many uncertainties in the NO₃ chemistry of biogenic VOCs. In my opinion, the paper under discussion is very well structured, showing the data in a concise manner. The great complexity of the NO₃-BVOC chemistry is highlighted through the paper and I agree with the authors that coordinated research projects on this subject is strongly recommended to provide a more complete view of the nighttime chemistry of areas with high levels of biogenic emissions. After addressing the comments/suggestions given below, this review is publishable in the Atmospheric Chemistry and Physics journal.

2) Specific Comments To be consistent through the paper the term “rate constant” or “rate coefficient” should be unified. Comments on Table 1 As this table compiles all data reported for the gas-phase rate constants of NO₃+BVOC reactions, alignment of columns is needed to correlate the value of k with the reference. Is it possible to include the temperature range in the T-dependence expressions? Is the second value for k in isoprene $1.21 \times 10^{-13} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$? In alpha-pinene, what is the uncertainty in 5.82×10^{-12} value? What about the stated uncertainties? I guess they are those reported by the authors, in some cases one standard deviation and in others, twice the standard deviation. Add a footnote to clarify this aspect. In my opinion, in a review the presentation of data should be done in order of publication (or inverse order, if you wish), but not mixed. Comment on Table 2 In my opinion, there is a lot of information of the last column. Can it be split in two columns: OA loading and relevant information? Comment on Table 6 As in the heading of this table it is stated that the data presented are relative to SOA formation, delete “SOA” from the third column. What was exactly intended to highlight in the last column named “References”? What do the author want to state by SOA/monoterpenes/chemistry/etc included in the last column? Is it possible to include a column with references for isoprene separately from monoterpenes? Comment on Figure 5. Include the permission of the journal in the caption. 3) Suggestions/ Typographical errors Suggestions of text addition/change are written in capital characters. Abstract, Line 17: “The first section. . .” could be replaced by “The first PART OF THIS REVIEW summarizes” or “The first SECTIONS. . .”. In fact, the first section is solely

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the Introduction on Page 5, line 8: "...BVOC, such as...monoterpenes, are..." Page 5, line 23: "BVOC-NO₃-derived organic nitrates" could be replaced by "organic nitrates derived from BVOC-NO₃ reaction" Page 7, line 10-11: "field observations relevant to the understanding of NO₃ and BVOC". This sentence is weird or seems to be incomplete. The understanding of? Page 14, line 26: "...hydroxyl nitrates FORMED from..."; "hydroperoxides FORMED from..." Page 16, line 23: (RH) should be placed after "Relative humidity" in line 21. Page 16, line 22: Add "...heterogeneous uptake of N₂O₅, PRECURSOR OF NO₃." Page 24, line 6: Replace "peroxy-radical" by "peroxy radical". Page 24, line 17: Replace "H-atom" by "H atom" Page 25, line 16-17: "...predicts [NO₃] between..." Use the multiplication symbol in the concentration values. Remove the semi-colon after the last concentration. The sentence "The higher values are associated with urban clouds, with rural and marine clouds an order of magnitude lower" can be rephrased as "High NO₃ concentration levels are associated with urban clouds, while in rural and marine clouds these levels are an order of magnitude lower". Is this a general trend? Page 26, line 15. "Eq. 5" should be "Eq. 2" Page 27, line 14: hydroxyl and nitrate radicals have been already defined previously in the manuscript. Page 28, line 10: Delete the hyphen after 10-2. Page 39, line 32: Replace "+/-" by "±" Page 40, line 13: "...from 2-900 ppt" is better to be written as "...from 2 to 900 ppt" Page 47, line 10: In my opinion, the heading is not necessary. Page 47, line 15: Delete an extra period. Page 48, lines 33-34: The rate constant units in cm³ molecule⁻¹ s⁻¹ for consistency with the rest of the manuscript. Page 49, line 1: The rate constant units in cm³ molecule⁻¹ s⁻¹ for consistency with the rest of the manuscript. Page 51, line 6: Replace "and Odum" by "AN (or THE) Odum"

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