

Interactive comment on “Production of peroxy nitrates in boreal biomass burning plumes over Canada during the BORTAS campaign” by M. Busilacchio et al.

Anonymous Referee #2

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This paper is deeply flawed and should be rejected. The authors should begin rethinking their approach by developing a theoretical framework that can be tested with their observations. I believe that will help organize the ideas much more clearly.

The paper has too many flaws to describe all of them. Let me give a few highlights.

1) The description of peroxy nitrates and their role is at odds with our understanding. In virtually all prior measurements, total PNS are approximately 85% PAN, 10% PPN and a little bit of others. Occasionally MPAN is also important. This paper attempts to calculate total PNS using only observed VOC and focusses attention on peroxyben-

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zoynitrate. That makes no sense. Similarly, the statement that o-xylene is the primary precursor for total PNs is ridiculous. There are a number of papers that attempt to describe a full budget for PAN and whether/when it is better to think about net production of PAN vs. thinking about PAN as a molecule in steady-state (e.g. LaFranchi et al. 9, 7623-7641, 2009 and references therein).

2) The authors observe biomass burning plumes over a wide range of ages. I expect total PN and O₃ at different ages to be responding differently—however the paper has no discussion whatsoever of the changing production of PNs and O₃. The Alvarado et al. paper referenced in this manuscript focusses on the near field. There are also lots of papers that talk about the role of PAN as it relates to ozone production during long range transport. Are those ideas not relevant to these plumes.? Why or Why not?

3) The chemistry of PNs and ANs may have very different time scales for return of the NO_x to the pool of active radicals. Those time scales are important to the interpretation of the observations.

4) The authors make relative statements about increases in PNs and Ox. It would also be good to make some absolute comparisons. For example, I would've guessed the free radical chain lengths in a fire plume are of order 7-10. If that guess (or a more sophisticated one developed by the authors) is right, what would the absolute and relative increase in Ox and PNs be?

5) Finally, this paper has 16 authors. I'd be shocked if all of them read the paper carefully and are willing to stand behind the conclusions as written. The primary authors should make sure that they only includes coauthors who are willing to stand behind the basic message of the paper even if they don't understand every detail.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 6009, 2015.

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