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## ***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 #3**

Received and published: 26 March 2015

This paper describes aerial observations of NO<sub>x</sub>, ΣPNs, ΣANs, O<sub>3</sub>, CO, VOCs and so on over eastern Canada during the BORTAS measurement campaign. The authors examine O<sub>3</sub> and ΣPN production rates in boreal forest fire plumes and background air masses. Observational results are interesting and could be significant. However, analyses are flawed as described below, so I cannot recommend this manuscript to be published in Atmospheric Chemistry and Physics. While this paper might be publishable in the future, this manuscript should be rejected at this time and the author should re-analyze and re-write the manuscript. In addition, there are many mistakes for expression (including English). The authors should take care of them when the

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manuscript is re-written.

General comments:

1. I cannot understand why the authors select VOCs described in Tables for the estimation of  $P(\text{O}_3)$  and  $P(\Sigma\text{PNs})$ . There are much more kinds of VOCs and the authors measured at least a part of them. For example, I think the major component of PNs is PAN, but acetaldehyde is not selected as a VOC to estimate  $P(\text{O}_3)$  and  $P(\Sigma\text{PNs})$ . The authors might estimate  $P(\text{O}_3)$  and  $P(\Sigma\text{PNs})$  using much more kinds of VOCs and only a part of VOCs used might be listed in Tables and Figures. If so, this paper presents inadequate information since this point is not written clearly.

2. The definition of the branching ratio is wrong. The authors estimate alpha using the rate constants for reactions R3 and R4. R3 and R4 are reactions of peroxy radicals with  $\text{NO}_2$  and  $\text{NO}$ , respectively, so that  $\text{NO}$  and  $\text{NO}_2$  concentrations influence alpha values. Moreover, the contribution of R2 should not be neglected. If the branching ratio to R2 is large,  $P(\text{O}_3)$  and  $P(\Sigma\text{PNs})$  becomes small.

3. There are many mistakes in the text. For example, "althoughere" (page 6016, line 29). The authors should take care of the text.

Specific comments:

On page 6012, lines 23-25: (R2) can affect the  $\text{O}_3$  budget.

On page 6013, line 6:  $\text{R}'\text{C}(\text{O}) \rightarrow \text{R}'\text{C}(\text{O})\text{R}''$

On page 6013, line 8:  $\text{O}_2 \rightarrow \text{O}$

On page 6013, lines 8 and 9: Why double?

On page 6014, line 15: I confirmed the authors use photolytic converter from the references. It's OK, but the authors should add the information of the converter briefly in the text.

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Fig. 5: It is hard to see because of too small figures.

On pages 6019-6020: The explanation of the reaction mechanism is confusing. The authors should explain using structural formula.

On page 6021, line 23 “cold air”: The authors should add the information of temperature.

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

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