*Interactive comment on* "Nitrate radical oxidation of γ-terpinene: hydroxy nitrate, total organic nitrate, and secondary organic aerosol yields" *by Jonathan H. Slade et al.*

**Anonymous Referee #1**

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This paper presents a very interesting novel set of chamber experiments, examining the composition and SOA yield from NO3 + terpinene, and finding anomalously low organic nitrate and SOA yields compared to most monoterpenes but similar to that from α-pinene. This presents both an interesting mechanistic question – why are these yields so low? – which the authors address with some proposals, as well as providing important information for assessing overall OA budgets in regions where forest emissions may contain substantial terpinene, such as the upper Midwest of the U.S. The paper is very well written and the scientific conclusions are well supported in the text and figures. I recommend publication after addressing a few minor comments.

1) on p. 5 around line 85: Perhaps worth mentioning some other measurements of or-

ganic nitrate aerosol in the western US, by TD-LIF at BEACHON 2011 in the Colorado front range (http://www.atmos-chem-phys.net/13/8585/2013/), in various locations by FTIR (http://www.pnas.org/content/108/9/3516.full), and at Blodgett (http://www.atmos-chem-phys.net/12/5773/2012/acp-12-5773-2012.pdf). In the first two cases, they are surely likely to be multifunctional, and in the latter case the authors explicitly measure multifunctional nitrates. So I'd avoid the statement that these types of molecules have only been measured in the eastern US.

2) General comment: your chamber experiment likely has RO2 + NO3 (or RO2+RO2 where VOC » N2O5) as the dominant fate of the RO2 radical, which may bias to a particular product set. Given that ambient nighttime chemistry may have substantially more RO2 + HO2 reactions, maybe it's worth speculating on how that would affect your conclusions about paritioning implications.

3) p. 11 line 213-214, maybe reference Ng et al 2017 instead of Fry et al 2014, since Ng reviews all lit on NO3 + a-pinene. http://www.atmos-chem-phys.net/17/2103/2017/acp-17-2103-2017.pdf

4) p. 11, line 217 : "and likely g-terpinene, lose the nitrate moeity and hence are sufficiently volatile. . ."

5) p. 12: why would oxidation of 2nd double bond remove observed ON? Wouldn't this just double the amount of ON detected since you see each functional group and now there are 2 nitrate fxnal groups? The discussion of the secondary oxidation here is a bit confusing.

6) p. 14 VERY high Caero . So this makes your conclusions even more striking! Even at very high loading the yield was quite small.

7) p. 15 line 318 – could also be from RO2 + NO3

7.5) p. 15 line 365: I think there have recently been some hydroxynitrate quantifications during the FIXCIT chamber studies at Caltech, but to my knowledge none are published

yet.

8) p. 18 line 392: pinonaldehyde yield of 71% is not reported in Fry et al 2014... maybe wrong ref?

9) line 394: elaborate on "similar double bond character" – because each is adjacent to a branch point?

10) p. 19 around lines 404-407: does the MCM produce $HO_2$ in your simulations of the a-pinene chemistry, via the mechanism you suggest, or any other?

11) p. 19, lines 415-417: Also assumes that only 1 double bond is reacted, right? Or do you include rates for each in your simple box model?

12) p. 20 lines 422-425: could split out as a stacked plot to highlight the sources of $NO_2$, whether $N_2O_5$ dissociation or decomposition?

13) p. 23: is figure 1 wall-loss corrected?

14) Fig. 2: comment on uncertainty at low Mo – looks like SOA yield is not very well constrained that low.

15) line 491: "the right panel shows the same data on a log scale"

16) Fig. 4: could be clearer if same exponent on both scales – so the number scale could be different, but as it is now, both the scale and exponent are difference which makes it hard to see the slope. same for Fig. 5

17) Fig. 6: The O16 superscript in the label is a bit odd looking – necessary?

18) Fig. 9: related to 2 previous comments, could show modeled $HO_2$ here, if it produces any. And could split out $NO_2$ into recycled vs. $N_2O_5$ dissociation sources,