

# ***Interactive comment on “The $\Delta^{17}\text{O}$ and $\delta^{18}\text{O}$ values of simultaneously collected atmospheric nitrates from anthropogenic sources – Implications for polluted air masses” by Martine M. Savard et al.***

## **Anonymous Referee #2**

Received and published: 10 April 2018

The manuscript by Savard and colleagues presents interesting data worthy of publication. However, I found the results and discussion sections muddled and the important points worthy of highlighting buried. The manuscript could be improved by a focus on key findings and condensing or eliminating repetitive sections. For example, page 10 lines 24-35 are potential explanations for low observed  $d_{18}\text{O}$ ,  $D_{17}\text{O}$  values with important implications multiple communities. Additionally, challenging the assumption of  $\text{NO}_x$  isotopic steady state with  $\text{O}_3$  is a key takeaway (not mentioned until page 14). Why are these not highlighted more prominently in the abstract? The current conclusions in the Abstract and Conclusion by comparison are weak "isotopic signals of... are not interchangeable", and "invariably interchangeable".

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The manuscript needs a map to put the respective sampling sites and the surround potential sources in a spatial context. Without this information, it is not possible to discern how far sites are from each other.

The authors points out "very few" air masses passed over other sources outside the targeted ones in the preceding 24 hours. For those that did, are they removed from the analysis? Why is this data not shown- as it seems relevant.

The long variation in sampling times is concerning. For example, individual sample deployments ranged from 5 to 113 days. The authors should explore whether there is any evidence that the length of this sampling time caused any artifacts in their results.

Page 5, line 10: What is "preconized"?

Page 5: line 33: Why was MAD scaled by 0.6745? Where did this number come from? Needs justification.

The authors conclude Elliott et al found minimal fractionation between d18O of pNO<sub>3</sub>- and HNO<sub>3</sub>. Figure 2 from that paper shows ~10 permil differences during summer in the d18O values of these two components.

Page 1, line 19: Add distance to state how far collection sites are from major sources (i.e., from x to y km).

Figures 2a-c. Include 1:1 line to clarify your conclusion that data show a "vertical extent". More clarification needed here in this analysis/conclusion.

Discussion: Lines 18-35. This reads like intro text/results. Revise to lead off with a topic sentence that highlights your major finds and built supporting text around this.

Authors state that "Anthropogenic emitters involving combustion (O<sub>2</sub>) may generate primary NO<sub>x</sub> at or near sources that tend to carry low d18O and D17O values". It is not clear whether this is in reference to prior published studies, or whether this is one of their conclusions. Either way, it needs more justification.

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For the analysis on page 10 lines 7-22, it is not clear how the authors determined the relative proportion of R1, R2, R3 to calculate the influence of O3 on oxidation pathways from NO2 to HNO3 (R4, R7, R8).

I found the discussion on page 11 lines 13-25 very intriguing. How might seasonal differences in lifetimes affect how far different constituents travel? Is there any prior modeling work (e.g., GEOS-CHEM) that could support these ideas?

The authors refer to “seasonal changes in planetary boundary layer heights” but don’t explicitly state what these changes are and how they could impact their results.

Section 4.2 This reads as Results rather than Discussion.

Conclusions: What is “invariably interchangeable”?

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1103>, 2018.

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