

Comment on acp-2021-487

Anonymous Referee #1

Referee comment on "Oxidation pathways and emission sources of atmospheric particulate nitrate in Seoul: based on $\delta^{15}\text{N}$ and $\Delta^{17}\text{O}$ measurements" by Saehee Lim et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-487-RC1>, 2021

In elucidating the behavior of nitrate (NO_3^-) contained aerosol, research using stable isotope ratios has been actively conducted in recent years. In particular, the study of the $\delta^{15}\text{N}$ (NO_3^-) and $\Delta^{17}\text{O}$ (NO_3^-) of $\text{PM}_{2.5}$ in Seoul from 2018 to 2019 to quantitatively estimate the oxidation pathways of particulate NO_3^- and the source apportionment of major NO_x emission sources is a very innovative and academically valuable study. However, even though discussing dual isotopes, they were not being discussed effectively. In addition, several issues were raised, such as the lack of clarity in the explanation of many of the discussions. Therefore, it could not be accepted by Atmospheric Chemistry and Physics international journal.

Major points

- The studies on the environmental kinetics using $\Delta^{17}\text{O}$ (NO_3^-) and the source analysis using $\delta^{15}\text{N}$ (NO_3^-) were not organically linked. For example, how was the source contribution affected by the use of $\Delta^{17}\text{O}$ (NO_3^-) in the source analysis? How did the use of $\Delta^{17}\text{O}$ (NO_3^-) to elucidate the environmental dynamics affect the source contribution? It be made clearer how it was clarified and how the findings differed from past studies?
- The estimated source contribution should be discussed more quantitatively from the viewpoint other than isotope, because biomass burning is very large. Research on isotopes is still unexplored, and it is thought that it will be put to practical use only after such discussions.
- Many of the figures were characteristic figures, and many of them were very difficult to understand.

In addition, the other points are shown below.

Introduction part: It would be better to discuss isotope-related research and other research separately. In addition, Line 40 is an introduction to isotope-related research, and these should be discussed separately.

Lines 89-97: Please move to the method part.

Lines 98-113: The introduction of the research on $\Delta^{17}\text{O}$ (NO_3^-) should be described more clearly. Please rewrite.

Line 123: Table 1 should be added in line.

Lines 147-157: For the analysis method of $\Delta^{17}\text{O}$ (NO_3^-), it is stated to refer to Morin, 2009, but more details should be written.

Line 156: Is the standard deviation the mean of the standard deviations, or does it mean within that number? Please describe clarify.

Lines 162-164: It is not clear whether it is two steps or three steps. Please make the description clearer.

Line 267: Shouldn't source data be added here?

Section 3.1: There were few comparisons with previous papers, and more consideration should be given to the reliability and characteristics of the data. In particular, the discussion of isotopes after line 306 should be revised, since it only compares figures and does not refer to references.

Line 320: high relative humidity? Please describe clearly and statistically.

Line 452-Line 461: This part should be included in the section3.1? Isn't it better to summarize the discussion of source analysis in this section?

Line 476-479: Please move the method part.

Line 479-482: I would like you to clearly describe the discussion on the difference between the case where fractionation is considered and the case where it is not.

Figure 2: The figure was very difficult to understand. Rather than this figure, a scatter diagram may provide clearer discussion.

Figure 3: The figure was very difficult to understand. The comparison of sources is made, but is it the data of Rose, 2019? Do you consider isotope fractionation?