

Thank you for your constructive feedback, comments, and suggestions, which have helped improve our manuscript. We agree that our finding of a large $\delta^{15}\text{N}$ offset between active and passive collection is significant, and we have revised our abstract to draw attention to this finding. In particular, we have added the following sentences, “Our recommended vehicle $\delta^{15}\text{N}(\text{NH}_3)$ signature is significantly different from previous reports. This is due to a large and consistent $\delta^{15}\text{N}(\text{NH}_3)$ bias of approximately -15.5 ‰ between commonly employed passive NH_3 collection techniques and the laboratory-tested active NH_3 collection technique,” and added, “This work... and highlights the importance of utilizing verified collection methods for accurately characterizing $\delta^{15}\text{N}(\text{NH}_3)$ values,” to the abstract.

We understand the concerns about the length of the manuscript, which was also raised by Reviewer #1. As suggested, we have simplified our discussion of background NH_3 influences from our on-road measurements in the revised manuscript to the following, “Furthermore, we do not expect background NH_3 contributions to have played a significant role in the spatial $\delta^{15}\text{N}(\text{NH}_3)$ variability observed from the on-road measurements in the Northeastern US. While lower $\delta^{15}\text{N}(\text{NH}_3)$ values in non-urban regions might be consistent with an increased contribution from background agricultural emissions which tend to have a low $\delta^{15}\text{N}(\text{NH}_3)$ signature (e.g., -31 to -14 ‰; Hristov et al., 2011), we expect these temperature-dependent emissions to be minimal during the winter when the on-road measurements were conducted.” Additionally, we have shortened our introduction, moved the description of our denuder and filter preparation, handling, and extraction protocol to the supplement, and removed our discussion of the elevated vehicle $[\text{NH}_3]$, which distracted from our main point of characterizing the isotopic composition of vehicle derived NH_3 . Overall, these changes have shortened the manuscript by ~150 Lines. Below we provide a point-by-point response to specific comments raised by Reviewer #2:

Comment: Line 71 – clarify whether improvements refers to the sources or our understanding of them

Response: Here we aim to make the point that while $\delta^{15}\text{N}(\text{NH}_3)$ might be a potentially valuable tool for tracking NH_3 emissions, the number of $\delta^{15}\text{N}(\text{NH}_3)$ source characterization studies are limited. Thus, we need to enhance our $\delta^{15}\text{N}(\text{NH}_3)$ emission inventory before we can begin to utilize $\delta^{15}\text{N}(\text{NH}_3)$ as a quantitative tool for source apportionment. To clarify this point, we have changed this sentence in the revised manuscript to, “However, $\delta^{15}\text{N}(\text{NH}_3)$ source characterization studies are limited, particularly for non-agriculture NH_3 emissions (Chang et al., 2016; Felix et al., 2013; Freyer, 1978; Heaton, 1987; Smirnoff et al., 2012); thus, to quantitatively utilize this tracer for NH_3 source apportionment requires further improvements in $\delta^{15}\text{N}(\text{NH}_3)$ source emission signatures and an increased understanding of spatiotemporal variabilities.”

Comment: Line 76-78 – This sentence is worded unclearly.

Response: Thank you for pointing this out. We have simplified this sentence in the revised manuscript as follows, “To quantitatively utilize $\delta^{15}\text{N}(\text{NH}_3)$ for NH_3 source apportionment requires distinguishable isotopic signatures, such that we need to understand the drivers behind the reported large variability in $\delta^{15}\text{N}(\text{NH}_3)$ from vehicle emissions.”

Comment: Line 268-269 Is this sentence saying that the limit of detection for this method was higher than usual due to contamination? It’s hard to follow the logic.

Response: When using the BrO⁻/azide chemical method for converting NH_4^+ to N_2O , we find a significant reagent N_2O -blank. This reagent blank makes it difficult to accurately and precisely characterize $\delta^{15}\text{N}$ for low concentration samples, such that we only conducted $\delta^{15}\text{N}$ analysis for samples with an $[\text{NH}_4^+] > 2 \mu\text{mol}\cdot\text{L}^{-1}$. We have clarified this point in the revised manuscript to the following, “Briefly, $\delta^{15}\text{N}(\text{NH}_4^+)$ was measured based on an established off-line wet-chemistry technique involving hypobromite (BrO^-) oxidation and acetic acid/sodium azide reduction (Zhang et al., 2007), which was conducted for samples with $[\text{NH}_4^+] > 2 \mu\text{mol}\cdot\text{L}^{-1}$.”

Comment: Line 319 Define what is meant by fblank

Response: The f_{Blank} refers to the fraction of collected NH_4^+ that corresponds to the field blank. We have defined f_{Blank} in the text and rewrote the sentence in the revised manuscript to the following, “Blank $\delta^{15}\text{N}(\text{NH}_4^+)$ corrections were made for all samples when the fraction of the field blank ($f_{\text{Blank}} = [\text{NH}_4^+]_{\text{blank}}/[\text{NH}_4^+]_{\text{total}}$) were less than 30% of the total collected NH_4^+ , as the propagated $\delta^{15}\text{N}$ uncertainty generally did not exceed $\pm 2.5 \text{‰}$ for this f_{Blank} value.”

Comment: Line 430 Section 3.1.3 appears to have the wrong title

Response: Thank you for pointing this out. The correct subtitle “Mobile On-Road NH_3 Survey in Northeastern US” and has been changed appropriately in the revised manuscript.

Comment: Figure 7 – showing a median and interquartile range for two samples seems a bit excessive. Perhaps just report the two values as individual symbols.

Response: We agree and have adjusted Figure 7 in the revised manuscript, such that “On-Road (Trucking Routes)” only shows the two data points and not a statistical summary.

Comment: Line 671-Smirnoff is misspelled

Response: Thank you for pointing this out. We have fixed this mistake in the revised manuscript.