I would like to thank the authors for considering the comments and suggestions made during the first round of reviews. I have a few more minor comments and technical corrections to suggest.

Please note that all line numbers given in the following text refer to the version of the manuscript with the highlighted changes (titled “essd-2024-335-ATC2”).

The authors thank the reviewer for taking time to provide additional feedback to improve the manuscript. Please see point-by-point replies below. Line numbering in the replies refers to the revised manuscript submitted (not the tracked-changed version).

Minor comments:

Although the authors' decision to omit any discussion of the potential applications of the dataset is clear – invoking that interpretation or analysis of the data presented is not within the scope defined for the ESSD data descriptor manuscript –, it remains regrettable that no mention of these applications has been included. This omission precludes readers from gaining a comprehensive understanding of the extensive potential and richness of such a dataset.

> *We agree that the dataset is highly useful and understand the importance of highlighting this utility to the scientific community. Text has been added in the introduction to present suggestions for potential use cases for the dataset. Text has been added at lines 31-37 and 39-41.*

Regarding the CFA depth scale (l.253-254): “Any such differences were accounted for in the development of the CFA depth scale in the precise assignment of the top depths for each meter-long core section.”

Does this mean that there were no differences between the lab and field depths measured for the 55 cm ice sticks?

The wording here is unclear and we thank the reviewer for pointing this out. The full core was cut in the field to approximately one meter long pieces. Hower, due to the CFA freezer configuration during the 2018 campaign, the ~1 m sticks were cut in (approx.) half so that they would fit better in the melter setup. As such, the half-meter sticks were prone to the same field measurement conditions as the meter-long sticks, and the top depth assignment was performed at the top of each meter, despite the added break from dividing each piece. The text has been updated to clarify this in lines 185-191 and 227.

l.293-294: “We determined that additional delay time as time at which the derivative of the response curve of the standards reaches a maximum (approximating the midpoint of the sample response rise).”

Instead, I would suggest using the term “the midpoint of the *signal*/or/*standard* response rise”, as the delay time of each species is defined using the standards signals, not the samples.

We agree with the reviewer here and have updated the text to adopt the following phrasing for enhanced clarity: “approximating the midpoint of the signal response rise”

Legend of Table 2: The description lacks any mention of the median. It is also not mentioned or presented in section 5.2 (l.356-361).

We thank the reviewer for pointing this out. The text has been updated to include reference to the median values in the text and figure captions.

l.353: The section measured in 2018 goes down to 95 m, not 85 m, right?

That is correct. However, due to additional concerns with data quality and contamination of the microparticle dataset in the lowermost section of the dry drilled section, we only include depths down to 85 meters. The text has been updated to reflect this (lines 319-321).

l.399: It would be interesting to indicate how many additional peaks this method identifies. This could provide the reader with insight into the (quantitative) differences between the two identification methods. This would be of particular interest in the context of the discussion of bulk conductivity (with the presence of other ion sources), as it would allow for an estimation of the extent to which this phenomenon can influence the results.

This raises an interesting point. The conductivity method described here identified 72 peaks that are more than 3σ above a 90 cm moving mean, compared to the 32 volcanic events described in Vance et al. (2024). We appreciate the interest in a means of comparing the qualitative method used by Vance et al. (2024) to the method used in this manuscript. However, the Vance volcanic matching exercise only includes volcanic peaks that were able to be matched with at least one of the other Antarctic records (WAIS divide, Law Dome, and/or Roosevelt Island) based on qualitative matching of the sulfate signal. Thus, there may be volcanic sulfate peaks identified in MBS that were not included in the Vance et al. (2024) volcanic synchronization exercise.

The text has been updated to include the total number of >3σ conductivity peaks identified (72); however, we have refrained from using this to draw any further comparison to the number of volcanic horizons identified in Vance et al. (2024) for the reasons outlined above. See updated text in lines 356-357 and 368-369.

l.442-446: I disagree with using the term "strong correlation" for an r value of 0.43. While it is a significant correlation given the p-value, it is actually rather weak, at best moderate. Empirically, r-values between 0.25 and 0.5 are usually considered to indicate a weak relationship and values between 0.5 and 0.75 a moderate one. Furthermore, regarding the measured concentration ranges, it is clear that the median/average values are substantially higher in the discrete measurements than in the CFA data, even though no numbers are given (only shown in the figure in the appendix). Although I agree that the differences may not necessarily be due to an issue with the CFA data, this should at least be acknowledged in the text.

Thanks to the reviewer for raising this. We have updated the phrasing to indicate that the two datasets are significantly correlated, but that the correlation is moderate to weak. We have also updated the supplementary figure to include the median values of the two datasets and referenced this in the text to add to the comparison between the two datasets.

l.461-462: Please justify the minimal layer thinning at this site by referring to Vance et al. (2016).

We have updated the text to refer to the site description in Vance et al., 2016.

Technical corrections:

l.29-30: This sentence is a little confusing, particularly the parenthesis "(together with the Law Dome ice core)", given that MBS is now presented as one of the few ice cores.

The parenthetical has been removed for clarity.

l.207: The "That" in the "That these differences are minimal" could be deleted.

This has been fixed in the text.

l.209: "Due *to* differences…"

This has been fixed in the text.

l.223: “… target flowrates for each analyte *are* presented in Fig. 3.”

This has been fixed in the text.

l.272 and others: There are inconsistencies regarding the expression “standards run”, which is sometimes written in the plural form and sometimes in the singular (l.272, l.291, l.295, Table 1 legend, l.358).

The text has been updated at each instance to ensure consistency in phrasing.

l.296-298: “Other choices for delay calculations could have been to use the start of the rise or even the end of the rise, however due to smoothing can be hard to reliably identify, whereas the maximum of the derivative of the increase is easily and systematically identified.”

Please consider rewriting this sentence. It looks like some words might be missing, and the long sentence makes it harder to understand; in particular, the part “however due to smoothing can be hard to reliably identify”.

We agree that this sentence was unclear. It has been updated in the text to read as follows:

“Other choices for delay calculations could have been to use the start or the end of the rise. However, due to smoothing, these points can be hard to reliably identify, whereas the maximum of the derivative of the increase is easily and systematically identified.”

l.360: There is a missing comma between Ca^{2+} and Na^{+} in the parenthesis.

This has been fixed in the text.

l.414-415: Please rephrase, as the use of the term "seen" twice causes the sentence to sound somewhat peculiar.

This has been fixed in the text.

l.422: There is a missing space between “by” and “Vance”.

This has been fixed in the text.

l.440: Change the name of both figures to “Fig.” instead of “Figure”.

This has been fixed in the text.

l.461: The abbreviation “IE” is not defined in the text. The term “ice equivalent” was used in the abstract and introduction.

This fixed. The abbreviation IE has been defined at the first instance in the introduction.