Revision of EGUSPHERE2025-355

Revision and response to comments by editor Kaitlin Keegan – in blue

Dear Dr. Bohleber and co-authors,

Thank you for your revised manuscript based on the referees' comments. I agree that the readability of both the figures and the text of the manuscript has been improved. Below, I've included a list of specific comments that would further enhance the clarity of the writing. Regarding the reviewer's suggestion to combine the results and discussion sections, I agree with you and your preference to keep the sections separate. To make the structure of the results section clearer, consider either indicating the importance of looking at the samples in those three ways (sample sizes and measurement resolutions) in a previous section or renaming the results subsections based on the key finding or focus instead of the sample size or measurement resolution.

Thank you very much for these additional comments that helped us to further improve the clarity of the manuscript. We have changed the manuscript accordingly in all instances. Further details are provided below.

We have added an introductory paragraph to the results sections to better explain to the reader the rationale behind the subsections. We agree that this way, the structure of the result section should become clearer to the reader.

The following line comments are based on the line numbers in the tracked-changes version of the manuscript:
L18: consider rephrasing to something like “In ice without evidence of volcanic activity, and unenhanced impurity concentrations, we obtain…”
Changed accordingly.
L19-20: ‘exemplarily even higher resolution maps…” is awkward. Consider rephrasing to something like: “… and also include some exemplarily high resolution maps with a spot size down to 1 micrometer.”
Changed accordingly.
L20: It’s awkward to state “We use Na as a previously investigated reference element…” and not describe your Na findings here, because you describe your findings of S and Cl in the second half of the sentence.
Changed accordingly.
L24: should be “These results…”
Changed accordingly.
L56: should be “In the case of sodium,…”
We mean here that the case of sodium, chloride and sulfate makes up an important reference ensemble...we have removed “the case of” altogether.
L59: add ‘of’ after ‘diffusion’
Changed accordingly.
L143: a word is missing in the phrase "... datasets that allow to draw generalized conclusions." Change to something like "...datasets that allow us to draw generalized conclusions." or "...datasets that allow for drawing generalized conclusions."
Changed accordingly.
L182: stay consistent with how you refer to the impurities you focus on in this study. It

seems appropriate to use their common names in the Abstract and the first time they're mentioned within the main text of the manuscript, and then use their symbols for subsequent references to them.
We understand this comment. Our reasoning was that in the few sentences that refer to "sodium, chloride and sulfate" we would spell out the names of the ionic impurities (instead of using Na^+, Cl^-, and SO_4^{2-}) – and strictly use the symbols for the elemental impurities that are measured with ICP-MS. We have now added "ionic" to these sentences where needed in order to make this more evident.
L186: it's not clear what you're referring to in the phrase "within the range of this technique"
Clarified accordingly.
L189: Something like the following would be a clearer sentence to add here: "Na serves as a reference element to compare our maps to previous LA-ICP-MS maps."
Changed accordingly.
L195-196: by "to decide on", I think you mean something like: "Note that localization is key to determining the plausability of all these scenarios, and a fully quantitative analysis is not required."
Changed accordingly.
L197: "rather than" instead of "over" here would make the sentence clearer.
Changed accordingly.
Figure 1: Is the bottom left panel missing the scale bar?
Changed accordingly.
L524: this phrase is awkward and missing some words to make it clear: "... the maps visible if changing the applied resolution."
Changed accordingly.
L525: this phrase is awkward and missing some words to make it clear: "...the same dosage 10 for all maps."
Changed accordingly.
L561: "showed" should be "shown"
Changed accordingly.
L562: "bands" should be singular
Changed accordingly.
L563: it's not clear what the phrase "less abundant cases" means here; "present also" should be "also present"
Clarified accordingly.
L564: I think that you mean "On these grounds" here
Changed accordingly.
L609: "due to" instead of "by" would make this sentence clearer
Changed accordingly.
L611: the correct phrasing is either "resulting from" or "due to"
Changed accordingly.
L623: consider adding a phrase like "potential explanations" or "potential mechanisms" before "i) and ii)" to make this statement clearer
Changed accordingly.
L626: "large" instead of "high"
Changed accordingly.
L627: "practicality" instead of "practicability"

Changed accordingly.
L627-628: the phrase "... but similar to the 1 micron mapping exemplary investigations could be in reach soon." is confusing. Consider rewriting this for clarity.
Changed accordingly.
L631: "found" instead of "find"
Changed accordingly.
L632: "constraining better" is an awkward phrase, consider rewording to something like "constraining the mobility..." or "more precisely constraining the mobility..."
Changed accordingly.
L642: the colon should be a period; add a comma after "maps"
Changed accordingly.
L643: add "and" before "hence"
Changed accordingly.
L663: add "at" before "1"
Changed accordingly.

All the best,
Kaitlin