



Interactive comment on “Biogenic, anthropogenic, and sea salt sulfate size-segregated aerosols in the Arctic summer” by Roya Ghahreman et al.

Roya Ghahreman et al.

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Dear Dr. Alexander,

We are very thankful for your great comments. We believe that we have addressed all of the concerns. Please find the attached supplement: the revised sentences and sections in the supplement are highlighted with green color.

Yours Sincerely,

Roghayeh Ghahremaninezhad, (PhD Candidate) Department of Physics and Astronomy, University of Calgary, Tell: +1 403 708 2332 Email address: r.gh.phy@gmail.com rghahrem@ucalgary.ca Comments and answers: 1. Since they use Na⁺ to correct

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for sea-salt sulfate, and sea salt sulfate is such a large fraction of total sulfate, this is critical as it strongly influences the value of their calculated $\delta^{34}\text{S}_{\text{nss}}$ and thus their conclusions. Supplement, page 6, line 3: The concentration of Na⁺ in blank papers has been reported.

2. Page 6: What is the analytical precision of the S-isotope measurements and how was it determined? Supplement, page 5, line 30: The standard deviation in replicate measurements of the standards is $\pm 0.3\%$.

3. Page 7: Wind speed also influences DMS emissions. Supplement, page 6, line 27: The “wind speed” has been added to the sentence.

4. Page 7 and throughout the paper: There are a lot of seemingly quantitative statements in the manuscript without the numbers in the text to back them up. For example, on page 7 line 13, how much less sea salt sulfate does it contain? Page 8 line 8, “the majority of sulfate” – what fraction is “majority”? Page 9 line 10, define what you mean by “high” and “low”. Page 9 line 22: what percent makes this “important”? Page 9 line 23, what percent makes this “dominant”? Supplement, page 7, line 8; page 7, line 26; page 8, lines 25 and 26; page 9, line 8; page 9, line 10: Fractions have been added.

5. Page 8 line 17: Also should cite Jaeglé et al. [2011]. Supplement, page 8, line 7: Thank you, we referred to this paper.

6. Page 10: The FLEXPART-WRF model results should be presented. I was expecting to see a plot of the back trajectories but this seems to be missing. Supplement, page 4, line 16; page 9, line 16; page 25, Figure 5: Some examples of FLEXPART-WRF results have been added (Fig 5).

7. Page 10 line 2: There is no evidence from the isotope data for a significant contribution: Supplement, page 9, line 14: Thank you, we corrected that.

8. Page 10 line 19: How were sensitivity tests performed? Are you running a model? More detail is needed here. Supplement, page 9, lines 25 and 26: We did not run a

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model. "Sensitivity test" has been changed to "analysis" to make this clearer.

9. Page 11 line 20: Again, plots showing the results of the back trajectory calculations would be useful to show in a figure and referred to here. Supplement, page 10, line 20: Some examples of FLEXPART-WRF results have been added (Fig 5).

10. Paragraph beginning on Page 11 Line 21: Shouldn't you be discussing the biogenic contribution here? It seems weird to ignore it here when it's so important. Supplement, page 11, line 3: More information about biogenic contributions has been added.

11. Page 12 line 6: replace "in solution" with "the aqueous phase". Supplement, page 11, line 15: Thank you, we corrected that.

12. Page 12 lines 6-8: Cloud pH also strongly influences the rate of aqueous-phase reactions. Supplement, page 11, line 18: Thank you, we corrected that.

13. Page 12 lines 14-19: How were these numbers calculated? You have to assume some value for $\delta^{34}\text{S}$ (SO_2) which is not stated here. Supplement, page 6, line 19: We used the isotope values from other studies. We added a sentence to make this clear.

14. Page 13 line 4: Would this make these samples biased high in the calculated anthropogenic fraction? Supplement, page 12, line 6: No, we compared $\delta^{34}\text{S}$ (SO_2) with $\delta^{34}\text{S}$ (SO_4^{2-}) (Figure 7). Results show that two samples (collected on July 15-17 and 17-19) contained more aerosols from anthropogenic sources (Table 3: $\sim 75\%$ and $\sim 60\%$ from anthropogenic sources). However for these samples the dominant source of SO_2 was biogenic (80% of SO_2 was from biogenic sources).

15. Page 13 line 22: from 0.49 to 0.95. Supplement, page 12, line 29: Thank you, we corrected that.

16. Table 1: Include fraction of nss- SO_4 here. Supplement, page 20, Table 2: The fraction has been added.

17. Figure 4: What do the error bars represent in Figure 4 and how were they cal-

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culated? There is no dashed line in my version of the figure. Supplement, page 25, Figure 4, caption: The standard deviations of each run were taken as the uncertainty for $\delta^{34}\text{S}$ values.

18. Figure 5: I would find this figure more useful if b and c showed fractions instead of absolute concentrations. Supplement, page 11, line 11 and page 21, Table 3: Table 3 has been added to report fraction of biogenic sources for each size range.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2015-1010/acp-2015-1010-AC2-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2015-1010>, 2016.

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