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Atmospheric Chemistry and Physics Discussions

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.

roya.ghahreman@canada.ca

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Dear Reviewer,

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 yellow 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. Page 2, line 23: "Sea salt enters the atmosphere via mechanical processes such as sea spray and bubble bursting" – this sentence is ambiguous. It could be good to explain briefly how sea spray aerosol is formed, with relevant references, such as (Lewis and Schwartz, 2004; Quinn et al., 2015). Supplement, page 2, line 25 to page 3 line 3: More details were added and we have now referred to "Lewis and Schwartz, 2004" and "Quinn et al., 2015".

2. Page 4, line 12-14: "The high volume sampler was turned off manually to avoid contamination when the ship's emissions toward the sampler were observed or at times when the ship was stationary" - Can you specify how often / how long are these period? Supplement, page 4, line 27: Table 1 (page 19) has been added to show periods when the high volume sampler was off for more than 30 minutes and why it was turned off.

3. Section 2: What are the uncertainties of the CF-IRMS? Supplement, page 5, line 30: The standard deviation in replicate measurements of the standards is $\pm$0.3 ‰

4. Section 2: Please comment on the performance / uncertainty of the cascade impactor and how they might affect your results. Supplement, page 4, line 29: More details were added on the performance / uncertainty of the cascade impactor.

5. Section 2: So how many samples did you collect in total? If the sampling period is 16 days (8-24 July) and your sampling interval is 2 days, then did you have 8 samples? Then why in Figure 3 you seemed to have only 6 data points? Please explain. Supplement, page 4, line 28, and caption of figure 1 (page 22): Sampling intervals for the high volume sampler: from 9 to 22 July (9-11, 11-13, 13-15, 15-17, 17-19, 20-22). Six samples were collected. The first day (July 8) was close to Quebec City so sampling was started the next day. Also, the high volume sampler was off because of stormy weather from 10:00 h on July 19th to10:00 h on July 20th.

6. Section 2, page 5, line 21-24: You cited some sulfur isotope apportionment in the Arctic. Did you use this in your calculations shown here? Please specify. Supplement, page 6, line 19: Yes, we used the values. We added a sentence to make this clear.

7. Section 2: Please include some short description of δ34S. Supplement, page 5, line 26: Description of δ34S has been added.

8. Page 8, line 15: “shows” should be “show”. Supplement, page 9, line 15: Thank you, we corrected that.

9. Page 8, line 17: Please remove “:”. Supplement, page 9, line 17: Thank you, we corrected that.

10. Page 9, line 1, 2: should be “ship emissions”. Supplement, page 9, line 24 and 25: Thank you, we corrected them.

11. Page 9, line 13: the grey filters from 2007, 2008: which study was this? Was it mentioned in the study? Please cite. Supplement, page 10, line 4: It was personal communication with Dr. Ofelia Rempillo.

12. Page 9, line 17: A re-definition of LTR. Supplement, page 10, line 10: Thank you, we corrected that.

13. Page 10, line 9: Please remove “:” Supplement, page 11, line 14: Thank you, we corrected that.

14. Table 1: This table display and format could be modified so that it is easier to pick out important information. There are too many brackets, e.g. Average sulfate (stdev) (ng/m3), hence confusing. Also the authors should avoid using too many horizontal and vertical lines in the table. Supplement, page 20, Table 2: The format of the table has been changed.

15. Figure 2: The time duration of the 3 graphs are not the same. I suggest that the time duration should match the sampling interval (8-24 July?), and please specify when support data is not available. Supplement, page 23, Figure 2: The time duration has been changed for the sampling period and more information has been added in the caption.

16. Figure 3: I would suggest using different color codes for SS and NSS. Also, it seems that in Figure 3a, sea salt sulfate was higher than total sulfate (second point from the top). It would be good to have detailed temporal data in number, so that it is easier to use and compare later, not just as average as currently in Table 1. Supplement, page 24, Figure 3: The color codes for SS and NSS have been changed. Also, concentration values have been added to the figure.

17. Figure 5: This figure is blurry and hard to read. Also, it should be SO42-. Please also specify which day/which samples were considered more “Arctic”, as it is difficult to flip back and forth to the transect figure to find out. I would suggest to name the sample 1, 2, 3, 4, 5, 6 or something, and keep the same consistent names in relevant figures and discussions. Supplement, page 27, Figure 6: Sampling intervals have been added to the figure. Also, Arctic and sub-Arctic samples have been distinguished in the caption of figure.

Please also note the supplement to this comment:
https://acp.copernicus.org/preprints/acp-2015-1010/acp-2015-1010-AC1-supplement.pdf

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