Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2015-1010-RC1, 2022
© Author(s) 2016. CC BY 3.0 License.

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.

Anonymous Referee #2

Received and published: 1 March 2016

Review of manuscript "Biogenic, anthropogenic, and sea salt sulfate size-segregated aerosols in the Arctic summer" by Ghahremaninezhad et al.

This is a fair manuscript presenting a data set of isotopic sulfates during a summer cruise in the Arctic. The study aims to use this data set to assess biogenic and anthropogenic sources and their contribution to aerosol of different size fractions. The cruise track (study area) is also interesting, as the Arctic is facing a lot of fast changes and data like this is much required. Overall, the scope of the study is relevant for ACPD/ACP and the method presented is rather scientifically sound.

General comments:

I think the paper would benefit from consistent re-structure/introduction of the samples, how many, which one is which as right now it is rather confusing moving from one figure to another. For example, one sample is called July 15-17, and then in Figure 5 you have to look for July 16 point, whereas in another figure (figure 3) you have to remember what day the samples were taken to extract relevant information, since it was not indicated at all there. Please also see the relevant detailed comments that I made in the later section.

The method and discussion part should be revised to also critically evaluate any uncertainty in the measurements, which might affect the results shown.

Specific comments:

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).

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?

Section 2: What are the uncertainties of the CF-IRMS?

Section 2: Please comment on the performance / uncertainty of the cascade impactor and how they might affect your results.

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.

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.

Section 2: Please include some short description of δ34S

Page 8, line 15: “shows” should be “show”

Page 8, line 17: Please remove “:”

Page 9, line 1, 2: should be “ship emissions”

Page 9, line 13: the grey filters from 2007, 2008: which study was this? Was it mentioned in the study? Please cite.

Page 9, line 17: A re-definition of LTR.

Page 10, line 9: Please remove “:”

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.

Figure 1: This is a fine transect.

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.

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.

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.

References Lewis, E. R., and Schwartz, S. E.: Sea salt aerosol production : mechanisms, methods, measurements and models : a critical review, Geophysical monograph, 152, American Geophysical Union, Washington, DC, xii, 413 p. pp., 2004. Quinn, P. K., Collins, D. B., Grassian, V. H., Prather, K. A., and Bates, T. S.: Chemistry and Related Properties of Freshly Emitted Sea Spray Aerosol, Chem Rev, 115, 4383-4399, 10.1021/Cr5007139, 2015.

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