Atmospheric
Chemistry
and Physics

Discussions

Open Access

EGU

Interactive comment on "Apportioning aerosol natural and anthropogenic sources thorough simultaneous aerosol size distributions and chemical composition in the European high Arctic" *by* Manuel Dall'Osto et al.

Anonymous Referee #2

Received and published: 8 July 2018

The authors collected a unique data set of particle size distributions as well as chemical properties from three high Arctic sites during a three-year period and performed cluster analysis of the PSD to investigate the aerosol sources. Since there are few studies on Arctic aerosols, this paper certainly provides meaningful and valuable findings. It extends our knowledge of Arctic aerosols regarding particle size distribution, possible sources and chemical composition. I would recommend this paper be accepted for ACP, but major revision is needed.

Suggestions for improvements and revision:

1. Is it possible to improve the title to a more precise one? Because the readers may expect to see the quantitative apportionment of natural and anthropogenic sources of Arctic aerosols. The sources are mentioned in the abstract, but there is no clear description or speculation later in results and conclusions about which category may link to natural/anthropogenic origin. I understand this apportionment could be very difficult. Perhaps authors can find a better way to summarize the main findings of the paper and show it in the title.

2. The introduction looks quite long, so it could be shortened and the structure could be improved. For example, the third paragraph is very big (page 5 to page 7), mixing the research motivations of the three sites, the analysis method, and the need of international cooperation for future researches. Maybe authors can split the paragraph into two or more with a key sentence at the beginning or end of the paragraph, or remove some content.

3. The method part actually does not contain the main method used in this paper, i.e. cluster analysis, which was found in the result part (Page 12, Lines 15-23). Any special reason for this arrangement? I would recommend authors to put the brief introduction of cluster analysis after the section 2.3. Also, the authors may provide more details of how to decide the cluster number and the reason of the current selection.

4. The monthly average size distributions provide very interesting results but with limited interpretation. I would be interested to know the reason for the mode transition from June to August (single mode – bimode - single mode as shown in Fig.2). The size distributions in August and in October are very similar, anything wrong here? Should the diameter be shown as Dp to be consistent with previous text?

5. There are eight clusters of the aerosols in this paper, which are merged into three categories. The three categories were named quite early in section 3.2.1, but the following discussion was still pointing to eight clusters. I was lost in the middle of reading the paper. Maybe the authors can emphasize the three categories in the conclusion

part rather than naming them early without discussion accordingly.

6. The authors are suggested to double check the seasons mentioned in the text with the months. For example, Page 15, Line 7: spring months are mentioned in the text while the peak of the curve was shown in June (summer?) at GRU site in Fig. 4a.

7. Please double check the language to make sure the sentences are correct or precise enough on what you want to say. For example, Page 12, Lines 22- 25, grammatical error? Page 18, Lines 12 - 14, it may be better to add a constraint of the sentence because the biogenic source could also be the major source for the nss-SO4 over the remote ocean. Page 19, Lines 11-13, does the "it" here refer to DMS or MSA? You may want to say DMS?

Other general comments:

1. Please use the uniform unit, e.g. degree for latitudes, Page 7 Line 22, Page 8 Line 11, Page 8 Line 16; for distance, km or Km; Fig. or Figure.

2. It seems there are many "double blank" between two words, which should be removed, e.g. Page 4, Line 20, between "they" and "have"; Page 4 Line 24, between "analysis" and "linked".

3. Please correct the title of the Figure 1, should be Jan – Dec. (a – i), also Fig. 1a – i was covered by a shadow.