

Interactive comment on “Aerosol size distribution seasonal characteristics measured in Tiksi, Russian Arctic” by E. Asmi et al.

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We are very grateful for referee for their work and excellent comments which helped us improving the manuscript. Our detailed answers are indicated below, and we hope the referee finds these satisfactory.

COMMENT: The dataset is a very fruitful and very important to the community. The science behind it is well worth the scope of ACP, and the introduction is appropriate. However, this paper as it stands needs severe major revision in order to go to ACP. At this stage, the paper does not tell a story and the data analysis (and particularly the presentation of the results) is poor.

OUR ANSWER: We thank the referee for acknowledging the importance of our data

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set, as well, we share the opinion that the manuscript would benefit of further analysis, which we will try to address with the modifications explained below. We wish the referee will find our revised manuscript more suited for publication in ACP.

COMMENT: Goals: in the introduction it mentions accessing nucleation events, biogenic emissions and wild fires, but in the results very few data are presented on this regards. It took me an hour to understand what table 1 and table 2 are. There are a number of clustering analysis, and I am not sure which one is which. I suggest making a table or explaining well what the statistical analysis are. When presenting clusters results, perhaps using subscripts and mentioning if they are smps,aps,volume, number or whatever data and analysis are presented and discussed.

OUR ANSWER: Thank you for this comment. In the revised manuscript, we cut most of the cluster analysis out, and made only one tiny clustering experiment with five (5) clusters found. We hope this makes the paper easier to read and follow. Additional parameter of aerosol black carbon concentration was added to explain these clusters. And eventually, we used these clusters to pin-point the size distributions connected with different events, further analysed later in the manuscript (i.e. fire events, inversions, secondary particle formation). By cutting out some of the cluster analysis, we could add a chapter making a complete analysis of new particle formation including event frequencies, and particle formation and growth rates. This is actually a very interesting addition to the manuscript, also to our view, and we hope it answers the referee concern about more analysis needed for sources. For biogenic emissions, we find that there was quite a number of analysis on this topic already, but added some analysis on fire events. However, rather we see that this could be a topic of future manuscripts since making this analysis in fact needs a lot more additional data (gases, satellite products), and is thereby out of the scope of this manuscript. Here, we just wish to present that these wildfires have potential to affect size distributions also in the Arctic, but not yet to make a complete analysis to give quantitative numbers of their effect. We hope that referee understands this choice. To improve the manuscript in this respect, we however

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separated those wildfire cases which clearly came out in clustering analysis, using them as examples of the impacts of wildfires (e.g. in Fig. 10 in revised manuscript, Fig. 7 in previous). Now the impact of those isolated wildfire cases for particle mass and CCN numbers are analysed separately. We hope that this further emphasizes the point we're making.

COMMENT: section 2.2 It is written many other parameters are available, but only mainly meteo are used to describe the clusters - and it is easier to make mistakes when using only these. Are gases not available? Later in the paper BC data appears, surely it is needed to calculate average BC concentrations to see what clusters are related to natural or non natural emissions. Diurnal profiles of clusters are also missing.

OUR ANSWER: BC was added as an explanatory factor in the new cluster analysis. Gases, such as SO₂ or CO were not available for this study (measurements of these started / will start later). As explained in our previous answer, in revised manuscript we wished minimized the cluster analysis to serve one purpose only: to pin-point the size distributions connected with different events, further analysed later in the manuscript (i.e. fire events, inversions, secondary particle formation). For this reason, also diurnal or seasonal profiles were not presented, however, some indications could be found in average radiation and temperature values calculated for each cluster. If referee finds this still relevant for the manuscript, we would be happy to extend this to analysis.

COMMENT: section 3.2, using bullets points would help the reader to follow this complicated categories. I suggest expanding this analysis with additional aerosol data if available, cause at this stage the analysis is poor and there are many different cluster analysis difficult to follow.

OUR ANSWER: This section was modified completely, most of cluster analysis was deleted and BC was added as an additional parameter. We hope referee finds our choice acceptable.

COMMENT: In summary, whilst the dataset is very useful, the data analysis and the

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presentation is not up to standards of ACP. I suggest making major revisions and clearly present the different clustering analysis.

OUR ANSWER: Thank you once again for this and other comments, which we found very helpful. We agree largely with suggested changes, and hope that we could make the revised manuscript in better quality and more fluent and interesting for the reader and the field of science.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 18109, 2015.

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