We thank Referee #2 for her/his comments and suggestions which helped to improve the manuscript. Our response is formatted as follows:

Reviewer's comments

Author's reply

Changes to the manuscript

All page, line, section and figure numbers in bold refer to the original manuscript, all others to the revised version.

The manuscript presents a very interesting and comprehensive study, reporting the chemical composition of Arctic summertime aerosol, focusing particularly on TMA presence, defining particle origin, size and distribution. The chemical data are combined with important meteorological parameters and elaborated by proper methodologies. The discussion is extensive, clear and effective. For these reason I suggest its publication in ACP. I have only some minor questions:

(1) Do the number of collected particles was similar at the different altitudes? (Maybe I missed this information) I think you should have a comparable number of particles collected at different altitude level in order to assure representativeness.

The vertical profiles in **Fig. 7 and 8** show information of the total number of analyzed particles in each altitude on the left hand side. Relative fractions in **Fig. 11** refer to the total number already given in **Fig. 7**. However, **Fig. 11** had been changed anyway according to Referee#3. Now relative fractions in **Fig. 11** (Fig. 11) refer to the total number of TMA-containing particles in each altitude bin.

Numbers differ in different altitude levels between approximately 70 and 1200 **(Fig. 7),** 20 and 300 **(Fig. 8)** as well as 30 and 400 (Fig. 11). Nevertheless, the total particle number in each bin is sufficient to conduct statistical approaches.

(2) Although the results are very interesting, you analyzed only 7412 particles. . .how this small number could be considered representative for summertime Arctic aerosol?

We included discussions considering limitations by the number of analyzed particles and representativeness in the conclusive part of the revised manuscript as follows:

p.20, l.6 – p.21, l.3

SPMS measurements do not provide bulk analysis of aerosol chemical composition, therefore we can not obtain TMA mass concentrations. Nevertheless, the number of particles analyzed by the ALABAMA (> 7000) is sufficient to conduct a statistical analysis. This allows us to draw conclusions about mixing state, vertical and size distributions as well as potential emission sources of particulate TMA in summertime Arctic regions.

p. 22, l.17 – 20

This is the first study demonstrating the incorporation of amines in Arctic aerosol from inner-Arctic sources. Based on spatial and temporal limitations of our measurements, it is difficult to assess how representative our findings are of the broader Arctic region. However, recent measurements confirm the presence of particulate amines and its marine-biogenic source at another Arctic site (Alert, 82.5 °N) (Leaitch et al., 2017).

(3) You discussed TMA but there are other type of amines which were not investigated and which could help in source apportionment studies. . .why didn't you consider other compounds (eg. Amino acids)?

We investigated the presence of other alkylamines (other than TMA) and amino acid in ambient single particles. We found that none of this previously identified SPMS marker ions of other alkylamines and amino acid distinctively appear in our ambient Arctic mass spectra besides TMA.

This investigation and the associated discussion are added to the supplementary part of the revised manuscript (Sect. 4). We further added the following comment in the main manuscript (p.8, l.5-6):

Other alkylamines (other than TMA) and amino acids could not be identified (Supplement Sect. 4).

(4) Why did you analyze backward trajectories only on 4,7 and 8 July? It would be better to clarify these points in the respective sections.

This had been explained in the original manuscript (caption **Fig. 12**/ Fig. 15**)** as follows:

Only time intervals with a total number of measured particles larger than 20 were considered. Measurements within the BL on 5, 10 and 12 July did not provide any 10-min time interval with more than 20 spectra.

In addition to changes suggested by the referees, we did some minor changes in the revised manuscript as follows:

(1) The vertically resolved fraction of different particle types in figures 6 and 11 are now cumulative presented. This improves readability and makes the comparison between different particle types easier.
(2) Particles summarized as "Others" appear now in figures 6 and 11.
(3) We unified axis notation in figures 5, 6, 10, 11, 12, 14 and 15.
(4) The colored flight tracks in Fig. 2 were partly wrongly assigned. We changed this.
(5) As described in the response to reviewer #1 comment #1, the inlet we used for aerosol sampling is not suitable for in-cloud measurements. Therefore, aerosol measurements inside clouds had been discarded. In the revised version of the manuscript, this selection had been made up for the vertical profiles (median and interquartile ranges) of $N_{d>5nm}$ and $N_{d>250nm}$ (Fig. 3).

Reference:

Leaitch, W. R., Russell, L. M., Liu, J., Kolonjari, F., Toom, D., Huang, L., Sharma, S., Chivulescu, A., Veber, D., and Zhang, W.: Organic Functional Groups in the Submicron Aerosol at 82.5◦ N from 2012 to 2014, Atmospheric Chemistry and Physics Discussions, 2017, 1–38, doi:10.5194/acp-2017-511, https://www.atmos-chem-phys-discuss.net/acp-2017-511/, 2017.