

Answers to the Referees' comments regarding the manuscript:

Marine Carbohydrates and Other Sea Spray Aerosol Constituents Across Altitudes in the Lower Arctic Troposphere

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We thank the reviewers for the evaluation of our manuscript. In this document, all of their constructive comments have been answered thoroughly. [The referees' comments are marked blue](#), our replies black, and [changed text in the manuscript green](#). The given line numbers of changed sentences are referring to the new lines in the revised manuscript. Please note that, following reviewer 1's request to move a figure from the supplement to the main manuscript and add another one, the figure numbering has been adjusted.

Reviewer 2:

Zeppenfeld et al. focuses on the role of marine carbohydrates as cloud/ice condensation nuclei and their transport throughout the atmospheric column via in situ measurements. This is an interesting and detailed study and highly relevant when considering the rapidly retreating sea ice in the Arctic and how it could impact regional cloud and precipitation formation. The sampling that shows the evolution of the particles with height is especially interesting. The manuscript is well written and I have no comments on their methodology which is sound. I imagine that this will be of great interest the general ACP reader, thus I recommend publication.

Authors: We thank the reviewer for the positive and encouraging assessment of our work. We appreciate the recognition of the relevance of our study. We are also grateful for the reviewer's acknowledgment of the value of our vertical profiling approach and the soundness of our methodology. We are pleased that the manuscript is considered suitable for publication and of interest to the ACP readership.

Minor comment:

L47: Perhaps better to reword since some aerosol also absorb LW radiation from the earth's surface, e.g. instead of "sunlight" to say shortwave and longwave radiation.

Authors: We agree with the reviewer and changed this sentence accordingly. The new sentence now reads: "They play a crucial role in the radiation balance, directly by scattering and absorbing shortwave and longwave radiation, and indirectly by influencing cloud formation and phase state as cloud condensation nuclei and ice-nucleating particles (Lohmann and Feichter, 2005; Penner et al., 2001; Quinn et al., 2015; Yu et al., 2006)." (Lines 45-49)