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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical profiling of aerosol particles and trace gases over the central Arctic Ocean during summer" *by* P. Kupiszewski et al.

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Many thanks for the positive review of our manuscript and the suggested improvements. Replies to the specific comments are as follows:

1. Page 10397, Lines 12 - 15: Sentence has been reworded as: "Within the lowermost couple hundred meters transport from the marginal ice zone (MIZ), condensational growth and cloud processing develop the aerosol population".

2. Section 2, Methods Section: We agree the "Methods" section is fairly extensive. However this is somewhat unavoidable due to the variety of instruments deployed.

Furthermore, review #2 recommends adding “more technical details” to this section. Nonetheless, we have now removed several fragments in this section (on pages 10403, 10404, 10407) in order to make it as succinct as possible.

3. Section 2.3: We understand the need to make the manuscript as concise as possible. However, as back trajectory analysis is used throughout the manuscript, we consider it very important to highlight the uncertainties and limitations of this method. Therefore, we have left this section unchanged.

4. Figure 4: The plots have been enlarged in order to make them easier to see.

5. Page 10417, Lines 19 - 23: Warneke et al. 2009; 2010 citations added.

6. Page 10420, Lines 8 - 13: Orellana et al, (2011) and Gao et al. (2012) concluded from observations of microalgae and bacteria that the most biologically active period during ASCOS, at 87°N, spanned the transition period from the end of the summer melt to the onset of the autumn freeze-up whereas at the open waters along the ice edge, at ca. 80°N, summer conditions prevailed until the end of ASCOS in early September.

7. Page 10428, Lines 9 - 13: Coagulation is not a feasible method in this case, as the concentrations are too low for growth within the time frame observed. E.g. with a monodisperse population of 5 nm diameter aerosol particles and an initial concentration of 1000 p/cm3, it takes over 6 days before the size of the particles doubles (calculated using Aerocalc software by P. Baron).

8. Page 10428, Lines 24 - 26: The possible mechanisms for breakup of particles released from evaporation of cloud droplets are not the main focus of this manuscript, however they are described in detail by the referenced (line 23) Leck and Bigg (2010) paper, and the paper by Karl et al. (2013), to which an in-text reference has now been added.

Gao, Q., Leck, C., Rauschenberg, C., and Matrai, P. A.: On the chemical dynamics of extracellular polysaccharides in the high Arctic surface microlayer, Ocean Sci., 8,

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401–418, 2012.

Karl, M., Leck, C., Coz, E. and Heintzenberg, J.: Marine nanogels as a source of atmospheric nanoparticles in the high Arctic, Geophys. Res. Lett., 40, 3738–3743, doi:10.1002/grl.50661, 2013.

Leck, C. and Bigg, E. K.: New particle formation of marine biological origin, Aerosol Sci. Tech., 44, 570–577, 2010.

Orellana, M. V., Matrai, P. A., Leck, C., Rauschenberg, C. D., Lee, A. M., and Coz, E.: Marine microgels as a source of cloud condensation nuclei in the high Arctic, P. Natl. Acad. Sci., USA, 108, 13612–13617, 2011.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 10395, 2013.