Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2015-966-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size resolved morphological properties of the high Arctic summer aerosol during ASCOS-2008" *by* E. Hamacher-Barth et al.

Anonymous Referee #2

Received and published: 12 February 2016

The paper presents a hard-earned data set of single particle analysis of samples collected in the high Arctic during the summer of 2008. The analysis is used to categorize particles according to their morphological and chemical properties. The most significant result is that "the particles to be activated into cloud droplets over the Arctic pack ice areas can not be seen as simply organic salts". This result has implications for the modeling of CCN activity and cloud drop formation over the high Arctic. The paper should be published once the concerns outlined below are addressed.

p. 2, line 14: I'm not sure how particles can increase planetary albedo by absorbing sunlight.

p. 4, line 5: Is this meant to be Arctic SURFACE OCEAN DOM?

p. 5, line 21: Should be SVALBARD.

p. 11, line 25: Why is the size distribution characterized as "bimodal" when, on average, it contains 3+ peaks?

Figure 6 caption: I think it should be "unstable", not instable. Also the labeling of the two lines is confusing. In the lower panel there are central particles of HP (red line) and unstable central particles (green line). What line represents the aggregate, aggregate with film and skeletal particles? Also – in this figure and throughout, it would help the reader immensely if legends were added to the plots.

Figure 9: It is very difficult to tell the orange and red line apart.

p. 15, lines 13 – 20: It is unclear if the descriptions of bonds holding the marine polymer gels together are referring to gels in atmospheric aerosol or in seawater. Assuming seawater (given the Verdugo reference), the size range of nanogels (100 – 200 nm) and microgels (> 1000 nm) are larger than the airbone aggregate particles shown in Figure 9. How can this difference be reconciled?

p. 17, line 10: Should be IMAGING.

p. 17, lines 30 – 33: The dominant particle type was those containing both Na/K and Ca/Mg. Stating a "dominating content of Na/K" or Ca/Mg is not accurate.

Figures 5, 6, and 9: Each of these figures contains some version of the aggregate particle type but each shows different size ranges for that particle type. What is the definition of "airborne aggregate particle" shown in Figure 9 (which resides in the 10 to 100 nm size range) compared to the aggregate particle type shown in Figure 9 (which is in a larger size range)? How is this reconciled with the statement on p. 19, lines 30 – 33 that says "organic marine gel matter contributes to the particle number concentration . . ..especially at diameters below 60 nm"?

p. 20, lines 12 – 29: The discussion of the fragmentation of larger particles into smaller particles in the atmosphere due to UV radiation exposure is highly speculative and

not supported by direct evidence. The papers cited appear to be based on studies of seawater. What thermodynamically viable mechanism can break apart particles in the 100 - 200 nm size range in the atmosphere? As far as I know, there are no reported observations of such events. (By the way, the Karl et al. (2013) and Tanaka et al. (1980) references, which may provide some insight here, are missing in the list of citations.)

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-966, 2016.