

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

Anonymous Referee #1

Received and published: 23 March 2016

It is relatively easy to obtain detailed size distributions and bulk chemistry of aerosols but in order to understand the sources of particles and their individual chemistry, imaging and analysis of separate particles is required. This has not been a popular form of research because it requires the use of electron microscopes and a very large amount of microscope time to study a representative sample of the aerosol. Interpreting the results also requires experience and wide background knowledge of possible sources of the aerosol.

The paper under review is very valuable because it greatly extends previous work of this type on the summer high-Arctic aerosol using improved techniques and studying a remarkably large number of individual particles. I strongly recommend it for publication,

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but contribute a few comments that might be useful.

1. Sizing of the aerosol from electron microscope imagery is notoriously difficult and in this case has resulted in acceptable agreement with TDMPs size distributions. Subsequent investigators will want to try to compare their work with that under review. It should therefore be made clear what assumptions were made in sizing particles such as A in figure 4 where no shadow is visible, or B in that figure which shows a thin shadow on the lower edge suggesting that it is a flat crystal. Similarly, in figure 7, were the components of the chain aggregates assumed to be spherical, their volumes summed and the diameter of a sphere with the equivalent diameter calculated? If so, attention should be called to the paper by Rogak et al. (Aerosol Sci. Tech 18, 25-47, 1993) which showed that a mobility analyser bases diameter of such particles on the projected area rather than on the volume. This will affect the comparison of mobility and EM size distributions.

2. P.10 line 24. I can't understand why C and O were not detected on blank films of polyvinyl formal. In the supplemental data the carbon signature is strong, so the detector was sufficiently sensitive.

3. Droplet haloes: I don't believe the splash hypothesis is appropriate for low velocity electrostatic collection. In fact I think it is also doubtful for particles of the size of those in figure 10 collected by high velocity impaction. Stratospheric aerosol sampling by an Ames Research Center group (Farlow and Ferry) 40 years ago found that the sulfuric acid particles did not develop haloes if all contact with water vapour was avoided before examination. (Possibly in JGR 82, 4921-4929, 1977 but I don't have the article) It was later confirmed by laboratory experiments (Bigg, Tellus, 38B, 62-66, 1986). A possible explanation is that acid vapour extends outwards from the captured particle as a monolayer (or multiple layers) on the surface. On exposure to water vapour the molecules take up water and coalesce to form tiny droplets.

4. P.15, line 23: "the biopolymer networks of marine gels are water solvable". Solvable

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means that an answer is available for a problem. If you meant “soluble”, how could they exist as entities in the ocean?

The manuscript is well-written, the diagrams informative and the references very comprehensive. There are some instances where the spelling or wording differs slightly from conventional English usage and some of these are listed below together with suggested alternatives.

p.5, line 21: Longyearbyen, Svalbard

p.5, line 25 and beyond: Since you are reporting completed work it would be more conventional to use the past tense rather than the future tense. E.g., change “will use” to “used”.

p.6, line 2: according to morphological. . .

p.8, line 19: In order to compare (to) the number. . .

p.9, line 21: Although wolfram is more logical in view of its symbol, tungsten is the common English usage.

p.10, line 19: were not reliably detected

p.16 line 10: unstable

p.16 line 17: morphology to the

p.20 line 13: is capable of adding

p.20 line 30: In the hope of enhancing

References, p.23, line 5: Ayers, G.P.

p.23 line 8: pouchetii

p.25 line 4: Cambridge

p.30 line 21- 24: Remove hyphens in Ramaswamy, Isaksen, climate and Intergovern-

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mental

p.31, line 6: atmosphere

Figure 10 caption, line 6: degenerated

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