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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Growth of nucleation mode particles in the summertime Arctic: a case study" *by* M. D. Willis et al.

Anonymous Referee #2

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The manuscript "Growth of nucleation mode particles in the summertime Arctic: a case study" by Willis et al., describes physicochemical properties of atmospheric nanometer-sized particles during a summertime new particle formation event in the Canadian Arctic Archipelago. As the authors correctly point out, new particle formation events, which can form in summer in the Arctic due to clean conditions and higher photochemical activity, are considered to be an important source of cloud condensation nuclei in this region. Because of this, knowledge of the sources and mechanisms of these events are important in order to assess the coupling between terrestrial processes and the atmospheric hydrological cycle. This study makes an important contribution this understanding by providing high quality measurements. They are presently clearly, and in a well-organized manner.

I cannot find many flaws in this study and manuscript; however since it is my job to

provide helpful comments I offer the following suggestions that I hope might improve the overall quality of this manuscript.

1. Since the air mass for this day has spent a week over land (Devon Island), it would be helpful for the reader to know the nature of the land surface and possible sources of condensable gas precursors.

2. Figures 3 and 4. In the text, the authors discuss the lack independent behavior of the number concentrations of particles larger than 50 nm and those between 5 and 20 nm. That difference is best depicted by including the latter on top of the stack of plots in Figure 4. Not such a big deal, but it would allow for closer comparison of the differences between these distributions.

3. Figures 3 b-e show steady growth of the nucleation mode as the aircraft samples downwind. Since "growth" is such a critical aspect of this manuscript (the word appears 52 times in this manuscript), this reader at least is interested in seeing an estimate of the growth rate. This should be feasible given the steady wind conditions and data obtained in this study.

4. Figure 6: correct x-axis to show more clearly the range of particle diameter (it appears that the range starts with sub-10 nm diameters). Also, if the diameter is on the x-axis starts at 300 nm, and the minimum detectable size is 150 nm, then why weren't smaller particles detected by ALABAMA?

Minor editorial comment: For consistency, change the spelling of "sulfate" in Figure 4.

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