

## ***Interactive comment on “Characterization of aerosol growth events over Ellesmere Island during the summers of 2015 and 2016” by Samantha Tremblay et al.***

### **Anonymous Referee #1**

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Review of “Characterization of aerosol growth events over Ellesmere Island during summers of 2015 and 2016” by Tremblay et al.

This paper presents a detailed investigation into nucleation events in the Canadian arctic from summers 2015 and 2016, using aerosol size distributions and composition measurements. The paper is well written and the analysis is very thorough. So thorough in fact that it’s in danger of being a little boring at times, but the conclusions are quite interesting. Overall the analysis and data are good and I recommend publication subject to the following minor corrections.

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## Main comments

One thing to consider for good measure is iodine-based nucleation which has been observed in Arctic marine summers before. You should mention it in your introduction and then probably rule it out for your measurements.

P3 paragraph 2- why such a focus on GEOS-Chem? What about other models? Or just models in general?

Section 2.1 a map would be really useful here, showing where all the field sites are and preferably the orography as well

P4 Paragraph 2- could you move all the discussion of the tubing etc to the supplement? It's good to be thorough but this doesn't contribute to the science of the paper. I'm sure you'll agree it's also not the most interesting paragraph ever written...

P4L23 Any idea why the difference in the OPC performance? How does that affect your AMS comparison?

P7L25 This is written strangely, it sounds like you are saying you got the numbers from table 1 from the 3 papers you reference, which isn't the case. I think it would be better something like *"Aerosol growth rates were calculated [say here very briefly how they are calculated and give the relevant reference(s)]. The initial growth rates from this study are included in Table 1."* It would be useful to comment on the meaning of this average growth rate as well, since it takes a lot more mass to go from 100nm to 101 than to go from 10 to 11. Is the number skewed towards being more representative of growth at any particular part of the size distribution?

P8L10 and Fig 6- can you add on the inversion strength for non-nucleation events and see if there is an obvious difference? That would strengthen your hypothesis that it's the lack of inversion that's creating conditions conducive to nucleation at the measurement altitude

P10L19 I'm not sure I agree there's a clear trend- there's a slight trend if you take

some pretty big averages but mostly there's just random noise. The average data points are not very far apart either. How does that compare to what you expect in this environment? I think adding some literature values to Fig 8 would be useful to add some context

P11L6 could you put the NASA worldview images in the supplement?

Finally, I think it would be useful to discuss the implications for of your findings for CCN concentrations in the Arctic.

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## Technical/stylistic corrections

I found the tenses very confusing throughout. Take for example the abstract. You say “*Measurements. . .were taken during. . .2015 and 2016*”. You then switch to the present (incorrectly in my view) and say “*These events are observed beginning in June. . .marine sources are the primary cause.*” It’s not like you took data from 2 decades and can really talk in general terms about events that you expect to happen every summer. You have data from 2 years, so it’s appropriate to refer to your measurements and things that you observed in the past. Then you talk about what the graphs show in the present. Other examples of incorrect tense are P2L16, P3L24, P4L18, but there are many more. Please be consistent and refer to things that happened in the past, in the past tense.

P7L23 preceding not proceeding

Figure 5 parts b,d,f,h,j- I think there are too many lines on one graph, it’s very difficult to make sense of. I think split these in two and consider using a more colorblind-friendly colorscheme.

Figure 7 Why are parts e and f plotted as m/z 4344 and not f4344? You do that with the mass fraction of OA vs SO<sub>4</sub>, I think it would be useful for the organic markers

Figure S5 Could you normalise the y axis so that the heights are also the f’s ie f44, f43 etc.

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