

Interactive comment on “Summer aerosol measurements over the East Antarctic seasonal ice zone” by Jack B. Simmons et al.

Anonymous Referee #1

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The manuscript focuses on constraining aerosol measurements made in the East Antarctic seasonal ice zone using measured absolute humidity and wind direction. Using these meteorological variables to categorize measurements enable the authors to identify differences in measurements between air originating in the Polar and Ferrel cells and also identify air originating over the southern ocean or free troposphere/Antarctic continent. The measurements and discussion provided provide important context for understanding aerosol processes in this region of the Southern Ocean, where little is known. I believe the manuscript merits publication after considering the comments below. Over all, comments are minor and involve suggestions on manuscript organization and a couple small suggestions for added analysis.

Main comments:

C1

Figure 1: Why are there no observations in one of the north/south transects of the SO? Ship exhaust? Or is it the software malfunction?

The sectors of wind direction focused on in the results accounted for 52% of the measurements. The results from this comparison are interesting, however some results on the other ~half of the measurements would be nice to provide a more complete picture, even if the air mass origin is not as precisely known. Excluding half of your measurements is a lot. The variability of aerosol properties from the southern sector are still important to know.

Why might transit aerosol (CN3, CCN0.55, distribution modes) be higher than the Ferrel cell category if the transit is largely in the Ferrel Cell?

Line 298-309 It is a little hard to follow this paragraph, but more importantly, it's unclear what the point of this paragraph is. If you are going to point out differences in mode diameters, some reasoning as to why they are different is necessary to justify the importance of identifying them. I am not sure you can provide some context for some of these small differences between mode diameters, but without it, the figure alone is enough to show the differences.

Line 343-352 Similar to the previous comment, you are essentially describing what is seen in the figures, but not providing context on why these differences are important or what they mean.

Line 318 – 339 Much of this comparison to Chambers et al. 2018 requires the reader to read Chambers et al. 2018 to understand it. It would be helpful to briefly include the necessary details from Chambers et al. 2018 to understand the comparisons you have made so that the reader does not have to read another manuscript to understand yours.

Section 3 is organized as if sections 3.1-3.4 are results and section 3.5-3.7 is the discussion. If you intend to keep the results and discussion separate, I suggest labeling

C2

the sections as such (i.e. change section 3 to results and add a section 4 titled Discussion which would include section 3.5-3.7). Otherwise you leave the reader wondering where the discussion is (as I have shown in my previous comments).

I suggest moving Figures S2 and S3 to the main text as they provide important context.

Line 421. While this statement may hold true, comparing the tail of the size distributions is not the same as calculating the value of CN3-10. While you do not have CN10, you could still calculate CN3-8, which is a similar comparison.

Minor comments/suggestions:

The manuscript formatting does not follow the ACP requirements.

Line 56. Change 'far' to 'remote'

Line 121. add space between 'L min-1'

Figure 2. Maybe define the Ferrel cell wind direction as WNW to be consistent with the text. The width of Ferrel cell sector is 73 deg, not 68 deg.

Line 202. What are 'these' measurements

Line 207 15% of figure 2a or 2b?

Line 211. I know you defined the bin width elsewhere, but it may be worth restating here.

Line 212. Stick with 'sectors' and remove 'windows'

Line 223. The measurements are labeled "Southern" in Figure S1 (not "No Category")

Line 282 Reference the relevant figure

Line 292 What finding?

Line 299 Reported where?

C3

Line 334 It would be better to explain what a 'Type 3 and Type 4' day is in Chambers et al. (2018)

Figure 6. change atmospheric pressure to atmospheric sea level pressure

Section 5 – Please provide a direct link to the data.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1213>, 2020.

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