Review of manuscript ACP-2018-245

Presented in this manuscript are the data from the measurements of total concentration and size distribution of aerosols and CCN concentrations at several different supersaturations in three austral summer seasons at an Antarctic site. Despite their importance, such measurements have been relatively rare due to remoteness and harsh environment of the Antarctic region. In that sense, this manuscript can be a valuable addition to Antarctic aerosol dataset. This manuscript is well organized and easy to follow. I think that this manuscript can be accepted for publication with some minor revision that I indicate below.

Major comments:

As the authors did, the critical diameter for a given supersaturation can be estimated by simply comparing CCN concentration at the given supersaturation to particle size distribution and finding the diameter at which the integrated particle concentration matches with the CCN concentration. From the critical diameter for the given supersaturation, kappa can also be estimated as the authors did. In this approach, however, the important assumption is that all particles were of the same chemical composition, i.e., internally mixed. The authors should explain how well this assumption can be justified for the Antarctic aerosols. Furthermore, particle size distribution measurement should be made for dried particles to be able to legitimately designate the matching diameter as the critical diameter. However, the authors seem to have measured ambient particle size distribution, not dried particle size distribution. The RH in this region was occasionally very high (e.g., 1 Dec. 2014). The RH of the sample air would have been lower than the ambient RH because the temperature of the container was higher but I doubt that particles were completely dried in the sample tubing. Therefore, the authors could have overestimated the critical diameter and underestimated kappa. The authors should make some detailed discussion on this issue. To note is that my comments is to the version of the manuscript posted for ACPD.

The authors showed representative percentile concentrations only for CEs in Table 2. Adding those for MEs (perhaps excluding precipitation days) would be informative, giving some quantitative measure of the difference between CEs and MEs.

The authors did not analyze the variability of kappa with respect to different air mass origins due to high uncertainty. However, the authors can present some representative kappa values for CEs only and MEs only. They may not show a meaningful difference but such result would support the argument that large particle concentration did not have significant dependence on air mass origin.

P5, L16: It was mentioned that necessary corrections were very high in the two LAS channels below 100 nm when the authors used ammonium sulfate particles. What about 100 nm particles? I also wonder if the differences between LAS and SMPS were similar for ammonium sulfate particles and PSL particles of the same selected size of 100 nm.

The estimated kappa values were compared with comparable measurements in some other studies. The same should be done for total particle concentrations and CCN concentrations to illustrate how these concentrations fair with other measurements in the Antarctic region.

Minor comments:

P2, L24: positive → increasing

P5, L29: also → at; Apparently the authors observed CCN at 1% SS. How often? What does "adjusted" mean here?

P6, L1-L2: It does not read smoothly. Rewrite this part.

P7, L27: remove one 'influence.'

P8, L8: 88152 is not a multiple of 15. Why?

P8, L9: here and at other places, the words "trajectory segment endpoints" could be misleading. In fact, the endpoint is the starting point of the air mass movement. Hopefully the authors can suggest better words.

P9, L20: panel C Figure 6, 7 → panel C of Figures 6, 7

P12, L34: a κ value of e.g., κ = 0.61 → a κ value of 0.61

P13, L5: I am not sure what you mean by "in the same order than the variability of the value itself." Rewrite it.

P13, L14: during which → when

P13, L21: "ammonium sulfate" can be replaced by "sodium chloride" if kappa is 1.75.

P14, L34: the here presented data → the data presented here

Figure 4: Explain the unit "g s/m3."

Figure 6: The legend of color scale in the bottom panel should be dN/dlogD instead of dN.