

Interactive comment on “Unexpectedly high ultrafine aerosol concentrations above East Antarctic sea-ice” by R. S. Humphries et al.

R. S. Humphries et al.

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We would like to thank reviewer 2 for their considered comments. They have been an asset to the study and have led to an improved manuscript. Detailed responses to the reviewer’s comments are outlined below.

1. A thorough quality control process was undertaken and CPCs were maintained daily throughout the voyage to ensure the highest data quality. Unfortunately, due to operational delays (i.e. getting stuck in the sea ice for two-weeks), the supplies of working fluid for the CPCs was exhausted prior to the return northward journey from the polar cell. Consequently, we are unable to make a similar comparison of the CPC performance in the Ferrel cell at the conclusion of the voyage. However,

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the step change in aerosol concentrations in both CPC data streams suggests that the changes from the Ferrel to Polar cells is a real phenomenon, rather than an instrumental anomaly.

The information about the delays and inability to measure on the return voyage has been included in the Methods section for clarity.

2. This is indeed an important paper that was mistakenly omitted from this manuscript and we thank the reviewer for picking this up. The relevant results have now been included in the fourth paragraph of Section 3.

3. The reviewer is correct in stating that the community inverts the data with inversion routines, however this inversion process only corrects for losses within the SMPS itself, and does not account for losses in the external sample inlet.

The assumption that most studies do not correct for sample inlet losses is based on the absence of any description of these corrections in most manuscripts. In manuscripts reporting absolute number concentrations, it is vitally important to outline any corrections performed on the data. Since most do not, it must be assumed that these processes were not applied to the data. Additionally, because measurements of the smaller sizes are more difficult, uncertainties in absolute number concentrations are higher, and separate experiments must be performed to properly characterise aerosol inlets, transmission efficiencies in this size range (down to 3 nm) are not always performed.

Nevertheless, the text here has been updated to indicate that these studies, rather than stating they “do not correct for...”, has been changed to state that “[these studies] do not describe any corrections for...”.

4. Table 1 has been updated to include a location column.

5. The ship route from Hobart to the ice edge, together with the sea ice extent, is already included in Figure 7. An additional figure has been added to the appendix

(now Figure A3), which shows the CN_{3-10} number concentration overlaid on the ship's track.

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