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Atmospheric Chemistry and Physics Discussions

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

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We would like to thank reviewer 1 for their time put into the review. According to their comments, we improved our manuscript in a number of ways, the details of which are given below.

- Abstract – we agree the transition from the first three paragraphs to the fourth was awkward. Consequently, we have updated this introduction to include the ideas contained therein, but with better literary flow. Concepts that have been removed from the abstract have already been included in the introduction, hence no changes have been made to the introduction section.
- Methods – a new reference, a now publically available PhD thesis, has been

included which provides all the details the reviewer has asked for.

- Chap 3.4 – the reviewer has correctly picked up that the inclusion of the term "boundary layer" was used incorrectly here. We have instead changed this to "surface layer", and included an additional figure in the appendices showing the rise of the surface air in the forward trajectories.

- Discussion – we agree with the reviewer that the elevated CP concentrations could be temporary events not characteristic of the region. However, contrary to the reviewer's statement, it is possible that the permanent coastal research stations would not show similarly elevated CP concentrations to those observed in this study due to: 1) their location on the continent (in the north-west quadrant) where the circulation patterns leading to the elevated concentrations are the weakest, 2) the well-defined nature of the circulation patterns and 3) the latitudinal location where these AFT air-masses reach the surface is away from the coast, and once they reach the surface, they travel north, further away from these stations.
  Paragraph 4 of the discussion section has been edited to include these ideas.

Minor points

- Page 29142, line 7 – formatting issue corrected.

- Page 29142, line 12 – misspelling of Neumayer has been corrected.

- Figure 2 – the additional confusing tick marks on the right axis that were in reference to the left axis, have been removed.

- Figure 3:
  The description of the frequency analysis is not limited just to what is included in the caption, and together with the in-text description (Section 3.2, paragraph

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3), is sufficient to understand the figure as it stands. Consequently, nothing has been changed in this regard.
The caption however, has been updated to include the total number of trajectories used to calculate the figure.
The y-axis label of the figure has been updated to specify the altitude is above sea level.
Information about grid-box size has already been outline in Section 2.1, so has not been repeated in this figure.

- Figure 5 – the figure has been updated by reducing the size of the circle markers.
- Figure A1 – the figure caption has been updated to describe the three different instruments used for characterisation and referred to in the legend.
- Figure A2 – as in Figure 2, the additional tick marks on the right axis have been removed.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 29125, 2015.