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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of the inter-annual, seasonal, and diurnal variations of condensation particle concentrations at Neumayer, Antarctica" *by* R. Weller et al.

Anonymous Referee #1

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Review of "Characterization of the inter-annual, seasonal, and diurnal variations of condensation particle concentrations at Neumayer, Antarctica" by Weller et al.

General comments:

This work presents a CPC measurement data set of an impressive 26 years from the Neumayer station in Antarctica. Such long data sets of aerosol measurements are rare even from the more accessible locations in the world. The work gives an important insight on the long term trends of atmospheric particle concentrations and illustrates the spatial extent of anthropogenic particulate pollution. In this case, it would appear that the Neumayer station is not influenced by anthropogenic aerosols, given that there ex-

ist no apparent long-term trends in the particle concentrations. It is equally interesting to notice that large natural phenomena such as El Niño or the eruption of the Pinatubo volcano did not affect the particle concentrations at this location. In my opinion, the scientific content of this paper is important, methodology is valid, and the presentation of results is clear. I have only a few comments and suggestions that the authors should address, and recommend the paper to be published in ACP.

Major comments:

Even though the measurements seem to be carefully conducted and the authors have clearly filtered their data with caution, I was still missing some pretty basic information about the measurement methods: How often were the instruments calibrated and where? How often were the flow rates of the instruments measured (and how); what was the standard deviation of the flow rates and was this taken into account in the data analysis? Were there any systematic drifts in the flow rates? How long were the inlet tubes to the instrument, and were tube losses taken into account in the data analysis (this can be difficult though due to the lack of size distribution measurements)? What was the inlet tube material?

These issues are most important when assessing the results of the nucleation mode particles, or as the authors state, UCP3,7. In fact, this chapter was the only part of the paper which saw some trouble with. It is somehow difficult to believe that throughout the year, 20% of the particles would reside in the size range of 3-7 nm. Typically, particles with this size only come up during nucleation events. I would therefore guess that there is a systematic difference in the results between the two types of particle counters (CPC 3022 and CPC 3025) – at least this prospect should be carefully investigated.

Minor comments:

Fig. 1. Please state with which instrument the concentrations are illustrated during the time, when there have been more than one instruments in the inlet.

Fig. 3. I understand that the authors would like to have the annual concentration peak in the middle of this figure. However, all the other figures in the manuscript have the annual x-axis from January to December. Having this one from July to June somehow breaks the flow of the figures – it is more difficult to compare against multiple figures. Consider showing the limits of the austral summer and winter here.

Figs 4 and 5. Given that the years are so similar in figure 4, would it be sufficient to show only figure 5? Given that the information is again repeated in figure 8.

Fig. 9. I do not find the two error bars which should visualize the uncertainty of the calculated UCP concentrations (?).

Fig.10. I find this result very strange and I think the figure is redundant in the article. It gives an idea that the UCP concentrations behave like this throughout the year, which is certainly not likely. If authors really want to illustrate that the nucleation events which they observe are mostly occurring in the afternoon, I would restrict the data to only the clear nucleation events, i.e. when the UCP concentrations have been clearly elevated.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 20713, 2011.