Atmos. Chem. Phys. Discuss., 6, S597–S599, 2006
www.atmos-chem-phys.org/acpd/6/S597/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical composition of boundary layer aerosol over the Atlantic Ocean and at an Antarctic site" *by* A. Virkkula et al.

Anonymous Referee #2

Received and published: 19 April 2006

The manuscript relates aerosol measurements performed onboard an oceanographic vessel during a cruise over the Atlantic Ocean to the Antarctic Coast. Additional measurements performed at the Antactic station of Aboa are also presented. Authors are provided results on bulk and size segregated chemical composition of particles and their variations according to latitude. The subject is therefore appropriate to ACP.

The data set provided in this paper is undoubtedly of interest since very few opportunities exits to perform continuous sampling of aerosols over such a North-South transect. However, at this point, my feeling is that the paper remains very descriptive and superficial (in substance, I feel that an aerosol chemistry paper needs more than just an assessment of sea-salt in the coarse mode and OC and sulphate in the submicron

range) and does not provide a sufficiently detailed discussion on the results and their implications. More specifically, the use of impactor data is very limited in this paper although it could clearly bring some additional information on the origin of the aerosols and their deposition velocity. Also, a combination of impactor data and aerosol size distribution is a useful way to understand chemical processes involved with the evolution of aerosol properties upon transport. In both cases, the data exists but only a very little fraction of it is being used within this manuscript. One of the reasons may be that results from the campaign are split into different papers in particular for the impactor data (Virkkula et al., submitted to JGR). That certainly leaves less space to the present paper. Unless the discussion goes into more details possibly including the impactor information (not just Dp$>$1 μm and Dp$>$1 μm), I do not feel it deserves publication. Thus, I am very interested to see the more comprehensive analysis of the campaign data.

More specific comments are the following:

* One of the interesting features is the very low level of OC throughout the cruise. I would have expected more discussion on the implication of such results considering the O'Dowd et al paper recently published in Science with opposite results.

* I am not convinced by the discussion on the dilution over the Ocean without more information from the evolution of the size spectrum (from SMPS or impactor data) with distance from the Coast. Also the exponential fit may be questioned for some of the graphs in Fig. 7. (k is not defined in the text, by the way. It is intuitive but should be defined). Again, O'Dowd et al., in their Science paper have identified a marine source of POM. The original hypothesis for deriving half-value distance contradicts this paper.

* Shouldn't the half-value distance be modified according to the average wind speed during transport? Considering this information, what would be the average life-time and how does it compare to literature data?

* I really believe that the half-value distance should be discussed in consideration with

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the size distribution from the impactor data.

* I don't recall LONGTERM as a subproject of ACE-2

* The discussion relating the relationship between BC and EC is not very informative (p.11). Both the mass absorption and mineral dust effects are well known. The question is how the present data set contributes to better understanding of the BC/EC relationship.

* I disagree with the use of "chemical mass balance" when the mass is not measured. Apportionment would be more appropriate.

* How was the POM measurements performed during Aerosol99 ? This information is needed if a measurement artefact is used to explain discrepancies between the 2 campaigns. Also, artefacts with OC measurements go both ways. A fraction of POM could have been lost. Were the aerosol99 measurements performed with denuders ? Again, a better investigation discussing the 2 measurement techniques would help.

* Wouldn't it be more logical to use the same conversion factor to compare the 2 sets of OC data from this campaign and Aerosol99?

* Can you provide a reference for the fact that oxalate is exclusively from biomass burning. I expect a fraction to be of secondary origin.

* I question the validity of acetate and formate measurements using HV samplers. Most is in the gas phase and simply can condense onto the filter.

* The last paragraph (3.6) is not really informative. Clearly, the human influence is lower is the Southern Hemisphere. No doubt. As for variations of the degree of neutralization. This is all well known. Again, without the use of the complete data set available onboard, the information reported here does not contribute to any new information on aerosol processing over the ocean.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 455, 2006.