Atmos. Chem. Phys. Discuss., 6, S7020–S7022, 2007
www.atmos-chem-phys-discuss.net/6/S7020/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Latitudinal aerosol size distribution variation in the Eastern Atlantic Ocean measured aboard the FS-Polarstern" *by* P. I. Williams et al.

P. I. Williams et al.

Received and published: 5 March 2007

Response to referee 3

"i) In the paper by Koponen et al. (2002, J. Geophys. Res., 107, D24), the authors report aerosol size distribution measurements at the same route and approximately at the same time of year as in present study. In current work, the authors should definitely discuss and compare these previously got results with their original results, including number concentration values and modal structure of aerosol size distribution."

Please see the response to referee 2. This was discussed in detail there and will be included in the revised document.

“ii) During measurements on board the ship there is always potential that at least some of the data are contaminated, either by direct emissions from the chimney of ship or by other activities on board the ship. In this paper I would expect to see the discussion about how much the measurement result were influenced by the ship emissions. For instance, the highest values of hourly averaged concentrations (more than 170000 cm-3) may be due to the ship emissions.”

Please see the response to referee 2. The high concentration observed at that time is not thought to be from the ship’s exhaust based on the data filtering discussed in the response to referee 2 and the revised manuscript. The highest concentrations, however, were not measured in clean marine conditions.

“iii) In error analysis, the authors could discuss more about the sensitivity of standard deviation to averaging time in case of their data.”

Section 2.2 contains an error. Page 12871, line 16 should read “standard error”, not standard deviation. This will be corrected in the revised manuscript. As the error reported and propagated through the inversion routines is the standard error, then the relative size of the error decreases as the square root of N, when N is the number of discrete samples averaged. This will be stated in the revised manuscript.

“iv) Fitting coefficients in Eq. (2) and Table1 should have certain units, which are not mentioned in Table 1.”

These will be included in the revised manuscript.

“v) The authors might also consider giving the values or formulas of the gaseous diffusion coefficient Dg and the average kinetic velocity of the gas molecules cg used in calculations of loss rates. In page 12880 is said that the contribution from the spume mode is likely to be under-estimated and hence the total condensational loss rate is under-estimated. Can you give some quantitative estimation here?”

The values of Dg and c were calculated at the ambient temperature, the former using

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the binary diffusion coefficient evaluated according to Maitland (1981) and the latter from simple gas kinetic theory. The range of the diffusion coefficient was from 2.06 x 10-5 to 2.16 x 10-5 and of mean molecular speed was 204.2 to 210.7 ms-1. These will be given in the revised manuscript. These values are derived by assuming that the gas of interest was HOI. Quantifying the losses of the large aerosol, especially after this length of time, is not practically possible. Any instrument that has a sample inlet will be prone to losses of large ($>$10um) particles through the process of impaction and where long sample lines exist, sedimentation. Despite the short inlet and hence minimal sedimentation, the OPC inlet did have a cowl to protect from wind ramming and rain. It is feasible that at high wind speeds, large aerosol may not be efficiently sampled, rather swept past the inlet. Laboratory tests to simulate and quantify these potential losses have not been performed.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 12865, 2006.