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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.

Anonymous Referee #1

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Review of: "Latitudinal aerosol size distribution variation in the Eastern Atlantic Ocean measured aboard the FS-Polarstern" by P. I. Williams et al.

The authors present data from aerosol size distribution measurements during a cruise from Bremerhaven to Cape Town, i.e. covering a large area in the northern and southern hemisphere. They analyze these data in term of air mass history, wind speed and latitude, and study modal behavior. The data were collected with the same technique and hence the variations along the transect are expected to reflect real differences that can be ascribed to environmental conditions. These are original data and merit publication. However, I would like the authors to consider the general and detailed

comments below.

General comment

I have some concerns with the 'observed' mode at 0.6 μm, as detailed below.

The discussion on the loss rate of trace gaseous compounds (section 3.1) seems artificial: all the authors do is take the particle size distribution for the evaluation of eq. 3. Figures 8 and 9 show this. Figure 8 shows the variability of the integrated volume size distribution, displaced by the uptake coefficients, and Figure 9 shows in principle a modified (by the term in parentheses in eq. 3) mass size distribution. Hence it is no surprise that the maximum loss rates occur at the peaks of the volume size distribution. There is no comparison with data, and hence the discussion remains not conclusive, as regards the actual loss rates and the uptake coefficients (anything between 0.03 or 1?). I suggest to either shorten this section or delete it completely and include this assessment as part of the conclusion, i.e. the current last par. on p. 12880.

Detailed comments

Abstract, line 11: what is the range of wind speeds?

p. 12868, line 3: suggest to include Clarke, A.D., S.R. Owens and J. Zhou, 2006. An ultrafine sea-salt flux from breaking waves: implications for cloud condensation nuclei in the remote marine atmosphere. J. Geophys. Res., 111, D06202, doi:10.1029/2005JD006565, 14 pp.

p. 12873, line 14: the mode at 0.6 μm is hard to see in Figure 4, at the higher wind speed there is a hunch. Would it be more convincing if plotted as dV/dlogD (in fact this is doen in Figure 9)? See also next comment:

p. 12874, line 8: I think this mode is not very noticeable. Is this mode really significant. In view of standard deviations and errors? Especially in view of the concern expressed by the authors in the par starting at line 30, as regards sampling errors. Apparently the DMPS system had a sampling problem at higher wind speeds. Could this cause

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an apparent decrease in the concentrations smaller than 0.6 μm, leading to an apparent increase resulting in the 0.6 μm mode?

p. 12875, line 24: the apparent plateau in the wind speed dependence is a concern, especially for small data sets. Usually there are only few data for the highest wind speed. When data are available for wind speeds higher than in the data set presented, it is often observed that there is no plateau. The curves in Figure 7 which have error bars on them seem to be all within experimental error. Hence these data are not conclusive as regards the shape of the wind speed dependence. In particular I object to the conclusion that based on this data, which deviate from other data sets, is concluded (p. 12879, line 10-15) that 'the data suggests that Ĕ. there is a limit to the mechanical generation of film and jet modes in the open ocean'.

p. 12876, line 2: I am not sure that these particles are likely sea salt. Recent evidence shows that other materials contribute a large fraction to the sea spray aerosol (e.g., O'Dowd et al., 2004). The term 'sea spray' may be better here. In the discussion the authors also point out that there may be additional organic material present in the particles (p. 12878, line 20)

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Interactive Comment