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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantification of DMS aerosol-cloud-climate interactions using ECHAM5-HAMMOZ model in current climate scenario" *by* M. A. Thomas et al.

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We would like to thank the reviewer for her/his valuable comments. Please find below the response to your specific comments.

1. The new particle formation in the MBL is indeed less prominent. Our simulations show that the particle formation primarily occurs just above the MBL (peaking at about 850 hPa). In DJF months, the DMS-derived particles clearly dominate the total particle formation (e.g. Fig. 8) in the FT in the model simulations, and the interaction with existing particles (e.g. sea salt) is less significant. This may be due to the fact that the dominant process in terms of sulfate production is the SO2 in-cloud oxidation (Pozzoli

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et al., 2008b). The various reaction pathways of DMS to sulfate production in the model are described in second paragraph of section 2.

2. The main motivation of this study was to shed light on the contribution of specific processes in the CLAW hypothesis. The present study is the first such attempt to quantify this in the present day current climate scenario using a state of the art global aerosol chemistry climate model which includes a detailed representation of aerosol-chemistry-cloud microphysics. Therefore, the emphasis of our present study was on investigating the role of DMS rather than seasalt. We agree with the reviewer that seasalt also plays a crucial role over the southern ocean and we plan in future work to investigate this aspect. In our present simulations, seasalt emissions are parameterized by a combination of two source functions – 1. the approach of Monahan et al (1986) for small particle range and 2. of Smith and Harrison (1998) for coarse particle range. Following these two approaches, the source functions are merged smoothly in the size range 2-4 micrometers and fitted by two lognormal distributions.

3. We agree that the role of marine organic aerosol in CCN formation needs more investigation, and may be significant as indicated by previous studies (e.g., O' Dowd et al. 2004, Gantt et al. 2009). However, since our primary focus is on quantifying the role of DMS, we believe a more detailed evaluation of the role of organic aerosol is beyond the scope of this particular study. Currently, we do not have an explicit description of organics in our model. This aspect is now mentioned in the revised manuscript.

O' Dowd et al. Nature 431, 676-680 (7 October 2004)

Gantt, B., N. Meskhidze, and D. Kamykowski (2009), Atmos. Chem. Phys. Discuss., 9, 2933-2965.

4. The numbers in the table are reduced to 3 significant digits.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 3087, 2010.