

Interactive
Comment

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 general and specific comments.

General comments:

1. As mentioned in the section 2, the atmospheric DMS is converted to SO₂ by two major reaction pathways – 1. an abstraction pathway that leads to a day time reaction with OH and a night time reaction with NO₃ and 2. an addition pathway that leads to the formation of 75% SO₂ and 25% MSA. MSA is directly converted to H₂SO₄ in the gas phase, which is in turn converted to sulfate aerosol. So, ECHAM-HAMMOZ does

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take into account the formation of sulfate via MSA.

2. This point was also raised by Reviewer 1. It is an issue we will address in future work. Please see our response to Reviewer 1: Question 3.

3. This aspect is also raised by the first reviewer. As noted above the main motivation of this study was to investigate individual processes in the CLAW hypothesis. Please see our response above to Reviewer 1: Question 2.

4. In our simulations, the model is driven by ECMWF ERA-40 meteorological fields (available at 6 hourly time resolution). In this configuration, the prognostic variables of ECHAM5 (vorticity, divergence, temperature and surface pressure) are relaxed towards the ERA40 reanalysis data. In our present simulations, therefore, the model configuration does not permit feedback on the above driver meteorological fields. However, this is an issue we will certainly investigate in future simulations with ECHAM-HAMMOZ. This present paper forms part of the first model analysis steps towards that objective.

Specific comments:

1. Please note that in Section 3.1.1, the number of activated particles and CDNC (in-cloud) are discussed separately.

2. Please note that the H₂SO₄ concentrations presented in the figure 3 are only for 850 hPa level. As correctly pointed out by the reviewer, the in-cloud oxidation is the dominant process behind high values of H₂SO₄ concentrations. The large scale transport in to the lower FT is most likely the reason for high H₂SO₄ concentrations in SON months. However, since we have analyzed the percentage mean change in aerosol-cloud interactions, this should have not impact our conclusions.

3. Acronym is corrected in the revised manuscript.

4. Figure 6 is corrected in the revised manuscript.

5. The effect of DMS emissions on clouds in the northern hemisphere is relatively less

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significant mainly due to less coverage of low level liquid water clouds and dominance of other aerosol sources (for example, dust, smoke, anthropogenic aerosols etc).

6. There is a weak seasonality in the wo_ODMS simulation corresponding to the seasonality in winds. However it is dampened in Figs. 8 and 9 due to the scaling used to accommodate the dominating seasonality in DMS derived cloud parameters.

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

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