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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sensitivity of aerosol optical thickness and aerosol direct radiative effect to relative humidity" *by* H. Bian et al.

H. Bian et al.

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We thank the reviewer for her/his efforts in reviewing the paper. Most of the comments have been integrated within the manuscript. Page and line numbers are referred to the previous version of the paper unless indicated otherwise.

General Comments

1. Improve the language.

Reply: The language has been improved, particularly by Drs. S. Strahan, M. Chin, and J. Rodriguez.

2. I consider that the variability of the chemical composition variability of the aerosol did not attract the attention needed for the model results interpretation.

Reply: Thanks for the good comment. We modified the figure 9 and section 3.4 to address the composition issue. Please refer to the answer to the general comment of Textor for the details.

3. There are also open questions with regard to the sensitivity of AOTs to the RH vertical resolution as well as to increasing both spatial and temporal resolution; are calculated differences cumulative?

Reply: Good comment again. Please refer our answer to the general comment of Schltz.

Specific Comments

1. Briefly describe aerosol parameterization (size distributions, growth factors and dependences on RH) in section 2.1 since the results of the study strongly depend on these parameterizations.

Reply: We agree that the aerosol parameterization is important to our study. We added such a description in section 2.1 as suggested by the reviewer.

2. A statistical comparison between the observations and the model results and by separating oceans from the land in Figure 2 and appropriate discussion, would be elucidating.

Reply: Done. Please see the new table [Table 2 in the revised table] and the corresponding discussion in section 3.1.

3. Figures 5 and 7 lower panel: units of y-axis should not be marked as percent since then the numbers of y-axis should read between 0 to 25 and 0-10, respectively.

Reply: Good observation. Done.

4. Figure 1: More details on the input of these calculations are needed and a reference if available.

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Reply: Please refer to specific comment 1 and general comment 5 in Michael Schulz’s review.

5. Figure 3: Could you track the oceanic stations with color and discuss differences.

Reply: We did not separate oceanic stations from our discussion since there were so few of them. We pointed this out in section 3.1. However, we added a discussion of statistical analyses for Figure 2 in section 3.1, which discerns the difference between ocean and land regions.

6. Page 13243 (section 3.4) The conclusion that the levels of the RH and its diurnal variability at the two sites have opposite effect on the AOT calculations requires justification. For instance, the chemical composition of the aerosol might be a critical factor.

Reply: Good point. We made a substantial change for section 3.4. Please refer to the general comment of Textor for the details.

7. Conclusion needs some restructuring to provide better logical flow: Start with the aim of the study (page 13247, lines 20-24) and then show the results. Also the last part of the conclusion (in page 13248) should be in section 3 as part of the discussion.

Reply: The last part of the conclusion has been moved to section 3.4. We deleted the lines 20-24 in page 13247 to avoid repetition.

8. Page 13241, line 13: what about the role of organics in pollution aerosol?

Reply: Our model only considered organic carbon (OC). Fossil fuel OC was internally mixed with the other fossil fuel aerosol components. For an internal mixing fossil fuel particle, the higher fraction of sulfate is, the higher the particle hygroscopic growth is. Therefore, the pollution sulfate, not organics, was a major player in the AOT change when RH resolution changed in our study.

9. Page 13235: 2nd line from the bottom: 2. 2. Page 13239: line 7: factor of 2 increase

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Interactive Comment

: do you mean decrease? Define CTRH and CTRT before section 3.2 Page 13240: line4: versus Page 13240: Line 9: spatial resolution Page 13241, line 25 - remove in Page 13242: line 13 - remove in Section 3.3 last sentence move after discussion of Figure 4 Page 13245, line 10: remove again Next line: spatial not special Figure 4 caption: using

Reply: All technical corrections that the referee suggested have been done.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13233, 2008.

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Interactive Comment