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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tropospheric aerosol microphysics simulation with assimilated meteorology: model description and intermodel comparison" *by* W. Trivitayanurak et al.

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This paper documents the implementation of a two-moment aerosol sectional module, previously implemented only in a climate model, into GEOS-CHEM, a CTM driven by assimilated metereology. The implementation of the aerosol microphysical module into GEOS-CHEM will allow for more intensive model evaluation studies using field campaigns or satellite data in the future. The study performs comparison with two other models in an effort to offer insights to the contribution of processes that affect CN and CCN concentrations. The objectives of the paper are important research, but there are a few major issues that need to be addressed.

1. Gaining insights from model comparison is a challenge because models can have

very different treatment of physics, chemistry, numerics, etc. This study makes the task even more difficult by using different emissions and different simulation years (in the case of GEOS-CHEM and GLOMAP). I recommend the authors redo the intermodel comparision using the same emissions (at least for non sea-salt) for all three models and simulation year (i.e. same metereorology) for GEOS-CHEM and GLOMAP. In addition, the intercomparison would be more informative if the same oxidant fields are used for all three models.

2. A table listing the similarities and differences between GEOS-CHEM, GISS GCM-II', and GLOMAP models would be helpful to the reader. Some differences are never mentioned in the text (though some can be inferred from Table 1, e.g. GLOMAP does not include MSA); the differences can be listed explicitly in the new table.

3. The paper should address the differences between using monthly-averaged oxidant fields and using online photochemistry in GEOS-CHEM. Also, it is not clear if the monthly-averaged oxidant fields used for GISS GCM-II' and GLOMAP are averaged from the online results of the GEOS-CHEM simulation or from some other sources. If from other sources, how different are the oxidant fields (in particular OH and O_3) among the three models?

4. The lifetime of DMS calculated by GISS GCM-II' is about 3 times greater than the results of GEOS-CHEM and GLOMAP. Is the difference due to different OH fields or something else?

5. A detailed discussion of the similarities and differences of the moving-center scheme used in GLOMAP and the TOMAS module is needed. What are the pros and cons of the two modules? How much of the differences in the results between GLOMAP and GISS GCM-II' are due the difference in the simulation of aerosol microphysics?

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6. The three models used in the study have very different vertical resolutions, which can lead to very different vertical transport of species from the boundary layer to the free troposphere. The paper needs to address how these differences impact the model intercomparison.

7. Wet deposition is the dominant sink for sulfate; and wet deposition is strongly dependent on the modeled cloud and precipitations fields. A comparision of the modeled cloud and precipitation fields is needed.

8. One of the stated motivation of the intercomparison is to suggest observations required to eliminate intermodel discrepancies, but the paper makes no recommendations regarding what data are needed to help evaluate and improve the models.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14369, 2007.