Atmos. Chem. Phys. Discuss., 5, S208–S209, 2005
www.atmos-chem-phys.org/acpd/5/S208/
European Geosciences Union


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Naturally driven variability in the global secondary organic aerosol over a decade" *by* K. Tsigaridis et al.

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Received and published: 22 March 2005

This is an interesting and relatively straight-forward model sensitivity study on the influence of meteorology and chemical boundary conditions on SOA formation. I have a few specific remarks and questions. 1. Abstract l. 15: I guess the increase refers to the comparison of a low and a high year?

2. How much is the variability of SOA contributing to the variability of total aerosol?

3. What is the consistency between the meteorological fields used in the TM3 model and those in ORCHIDEE? As far as I understand; the results of ORCHIDEE are separately calculated and then fed to TM3. What timescale?

4. It would be good to have a paragraph describing the difference of ORCHIDEE; with the well know Guenther et al. fields.

5. p. 1257 l. 15. I do not really understand this statement; was the human induced SOA yield not governed by the much higher O3 concentrations? Did you expect variability to be of the same magnitude?

6. There are several studies focussing on O3 and OH variability in TM3 connected to ERA15. Peters et al. [JGR, 2001] and Dentener et al. [JGR, 2003]. It would be quite interesting to see whether this additional feedback through natural hydrocarbons emissions, is altering the signal of O3 and OH in those papers [feedback].

7. Why are the big difference in boreal Russia?

8. What was done with anthropogenic emissions? How about ozone boundary conditions (which influence OH, and O3)?

9. In Section 5 it is not mentioned what optical parameters for SOA were choosen, and how SOA is interacting with RH.

I think a main statement could be made that based on current knowledge the meteorological factors determining SOA production cause a variability far below the uncertainty of the SOA formation itself. I guess substantial other assumptions in the parameterisation (e.g. equilibrium or not) could change the conclusions a lot.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 1255, 2005.