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Atmospheric
Chemistry
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Discussions

Interactive comment on “Temperature and humidity dependence of secondary organic aerosol yield from the ozonolysis of β-pinene” *by* C. Stenby et al.

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Author comment in response to interactive comment of 13 March 2007 by anonymous referee #2

We would like to thank the referee for the very useful comments and suggestions, and we are planning to incorporate most suggested changes and additions in the revised manuscript.

1) The present paper is indeed an enlarged and re-written version of an earlier discussion paper in ACPD, Atmos. Chem. Phys. Discuss., 6, 10275-10297, 2006, www.atmos-chem-phys-discuss.net/6/10275/2006/.

Upon completion of the first manuscript draft dealing only with the temperature dependence of SOA formation from ozonolysis of beta-pinene under dry conditions, it was not clear if and when the corresponding experiments under humid conditions could be completed. Thus we proceeded to publication and discussion of the results obtained for the dry model system in ACPD. In the meantime, however, the experiments under humid conditions could be completed and analyzed faster than anticipated.

Since some of the referee comments on the original paper were directly related to the influence of humidity and because the results of the experiments under humid conditions are important for the overall characterisation and understanding of the investigated system, we decided to go for a comprehensive new discussion paper dealing with both the temperature and humidity dependence. We had planned to answer the referee comments on the first paper prior to publication of the second paper, but unfortunately we were unable to do so in time. Nevertheless, the highly appreciated and constructive comments have already been taken into account and a point-by-point response in the interactive discussion of the first paper has recently been published (Atmos. Chem. Phys. Discuss., 6, S7399-S7406, 2007).

2) Describing the model of Jenkin (2004) as a two product model was indeed a mistake, which happened in the course of rewriting. We apologize for this mistake and will revise the manuscript accordingly. As pointed out by the referee, the model of Jenkin (2004) included around 200 product species with individually modelled temperature dependencies. Also we will address the presence of an OH scavenger in the study by Jenkin (2004).

3) Section 2.4: We agree with the referee that the assumption, that all OH radicals react with beta-pinene, is not valid when beta-pinene tends to zero. For our experiments with ozone in excess, not more than 3.9% of the beta-pinene has reacted in the flow reactor due to the short reaction time. This leads to the conclusion that beta-pinene does not tend to zero in the performed experiments and we assume D[beta-pinene] = 1.35 (D[ozone]). This will be clarified in the revised manuscript.

4) The possible water vapour concentration dependence will be clarified in the manuscript.

5) Bonn et al. (2002) have performed most experiments not in the flow reactor but in a spherical reaction chamber and they reported a decrease in particle number and volume upon addition of water vapour. An explanation for this discrepancy could be that Bonn et al. used cyclohexane as an OH scavenger, whereas we used no OH scavenger. This leads to a difference in the reaction pathways in the two experiments, thus it is possible that the influence of the water vapour differs. This will be clarified in the manuscript.

6) Our results have been obtained at uniform temperature for oxidation and condensation. In the atmosphere it is likely that the oxidation takes place under warm and humid conditions as e.g. in Amazonas, with subsequent condensation when transported to the upper troposphere. With the increase in SOA yield under warm and humid conditions observed in our study, this could lead to even higher SOA load in the upper troposphere, where the discrepancies between model and measurements are found. We therefore do not find that our measurements increase the discrepancy. To clarify this fully experiments should be made were the oxidation and the condensation takes place at two different temperatures. This will be clarified in the manuscript.

Bonn, B., Schuster, G. and Moortgat, G. K.: Influence of water vapor on the process of new particle formation during monoterpene ozonolysis, J. Phys. Chem. A, 106, 2869-2881, 2002.

Jenkin, M. E.: Modelling the formation and composition of secondary organic aerosol from a- and b-pinene ozonolysis using MCM v3, Atmos. Chem. Phys., 4, 1741-1757, 2004.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 2091, 2007.