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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Parameterising secondary organic aerosol from $\vec{\alpha}$-pinene using a detailed oxidation and aerosol formation model" *by* K. Ceulemans et al.

Anonymous Referee #3

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The authors introduce a ten-parameter model for SOA generated from alpha-pinene. The model is based on simulations with another (BOREAM) model, taking into account the influence of temperature, type of oxidant, NOx regime, photochemical ageing and water uptake. This is a relevant scientific question within the scope of ACP.

The authors successfully make the case that current, highly detailed mechanisms are too unwieldy to insert into global chemistry models. They also state that parameterizations based on experimental data can lack sensitivity to various factors for which this model will explicitly account. The authors make a persuasive case that their model accurately (within a factor of 2) reproduces experimental observations under a variety

of conditions. Also, they convincingly argue that their method for determining water activity coefficients should be used instead of constant values (page 24 and figure 9).

I feel that this manuscript is suitable for publication in ACP, subject to the two specific comments below.

Specific comments:

The authors note that there is a very large uncertainty in the generic chemistry part of their model, because the choices of rate constants for further-generation oxidation products are made for a large number of reactions with no differentiation between them. It is unclear whether the uncertainty stemming from the choice of rate constants will lead to a large uncertainty in their eventual results; perhaps this uncertainty could be explicitly addressed in a subsection of Section 3 (by analogy to the other sections where changes in the parameters are explored). In the conclusion, the authors re-state the large uncertainty due to the chemistry of further generation products; for this reason, it would be good to see them attempt to estimate the magnitude of this uncertainty.

On page 16-17, I would ask the authors to include a statement about how the reference molecular weight (MWref) of molecules in the SOA was estimated or determined.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 23421, 2011.