

Interactive comment on “ α -pinene photooxidation under controlled chemical conditions – Part 2: SOA yield and composition in low- and high-NO_x environments” by N. C. Eddingsaas et al.

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We would like to thank the referee for their comments on our paper. Please find below our responses to the referee's comments.

This paper described a series of laboratory experiments exploring the photooxidation of alpha-pinene in the presence and absence of NO and acidic seed aerosol. The authors focus on particle phase composition which has enabled them to build a more complete understanding of the reaction mechanisms under the conditions investigated. Interestingly the authors have chosen to explore the greater atmospheric relevance of alpha-pinene photooxidation, relative to the more oft studied, but far less atmospheric

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cally relevant alpha-pinene ozonolysis.

1. Are there plans to include the more often studied systems in the future to enable a bridge between these new findings and prior work?

At this time we do not have plans to study the ozonolysis reaction.

2. Likewise are similar explorations of the even more important isoprene system to be explored? Both of these are logical extensions of this work and should be considered.

The gas phase, particle phase, and partitioning from gas-phase to particle-phase of isoprene photooxidation products has been extensively studied by the current authors, including particle phase composition, the effect of aerosol acidity, gas-phase oxidation products important to SOA formation, and the effect of NO_x. The following is a partial list of the papers published on the particle-phase and partitioning between the gas and particle phases of isoprene photooxidation products by the authors:

Kroll, J. H., et al. Secondary organic aerosol formation from isoprene photooxidation under high-NO_x conditions. *GRL*, 2005, L18808. Kroll, J. H. et al. Secondary organic aerosol formation from isoprene photooxidation. *Environ. Sci. Technol.*, 2006, 1869. Surratt, J. D., et al. Chemical composition of secondary organic aerosol formed from the photooxidation of isoprene. *J. Phys. Chem. A*, 2006, 9665. Surratt, J. D., et al. Reactive intermediates revealed in secondary organic aerosol formation from isoprene. *Proc. Nat. Acad. Sci.*, 2009, 6640. Eddingsaas, N. C., et al. Kinetics and products of the acid-catalyzed ring-opening of atmospherically relevant butyl epoxy alcohols. *J. Phys. Chem. A*, 2010, 8106. Floyd, K. D., et al. Contribution of isoprene-derived organosulfates to free tropospheric aerosol mass. *Proc. Nat. Acad. Sci.*, 2010, 21360.

3. I applaud the investigation of the role of aerosol acidity on the reaction mechanisms, but am left wondering why the authors were not quantitative in their approach. Previously a sub-set of these authors published investigations into the role of aerosol acidity on the formation of SOA from isoprene, but herein have not included the measure-

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ments described by Surratt et al. 2007 (ES&T). This is most likely an oversight, and could easily be rectified through the inclusion of the H⁺ in air measurements.

The goal in this paper with respect to the effect of aerosol acidity was to determine if there was an effect, and if so what was its effect on the aerosol chemical composition and what gas-phase species are involved. The quantification of additional SOA formation as a function of [H⁺] was not a focus of this paper. In the paper that has been indicated, Surratt et al. 2007 (ES&T), additional filter samples were taken on quartz filters specifically to determine H⁺ in air and the studies were done in a steady state flow cell conducive to these types of measurements. The current set of experiments were not performed in a way to obtain this information as no quartz fiber filter samples were taken in these experiments, only two distinct aerosol seeds were used, and the studies were performed in a batch reactor. In addition, the quantification of SOA growth from alpha-pinene as a function of H⁺ in air has previously been studied Offenberg, J. H. et al 2009 (ES&T).

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