

Hi Lisa,

Thank you for the helpful suggestions. We agree that these simple changes have helped improve the manuscript. Please find below our responses in blue and specific changes to the manuscript in red.

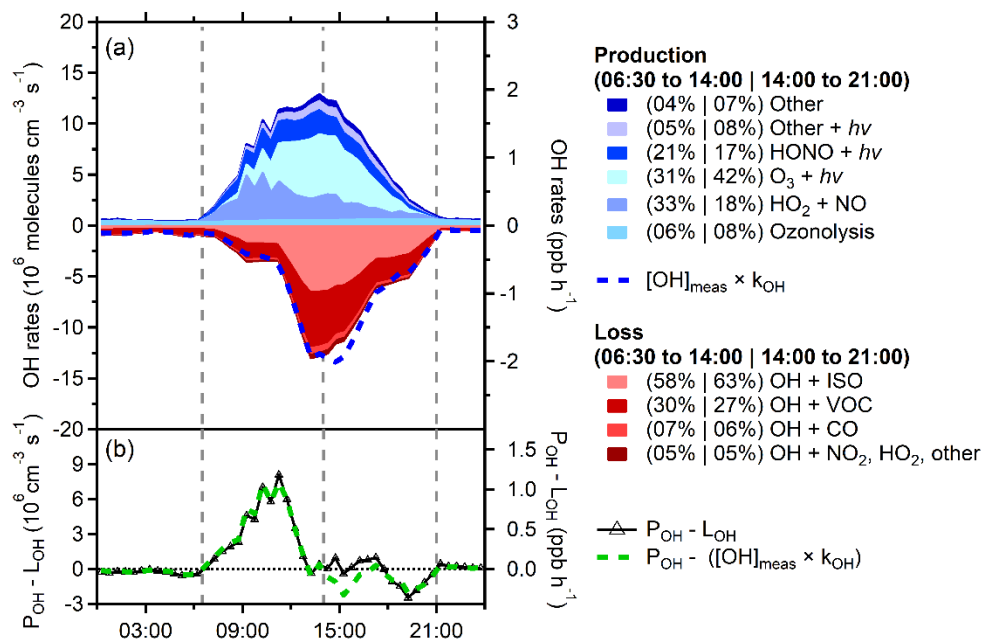
Editor Comments

Dear Authors,

I have checked through the revised manuscript and your response to the reviewers. I am suggesting a couple of very small additions that relate to some of the suggestions made by the reviewers which I think will benefit the manuscript:

Relating to the comment by reviewer 1 on the OH experimental budget, I think it would be useful to add the product of the measured OH concentration and measured OH reactivity (k_{OH}) to Fig. S3(a) and also show $P_{OH} - (k_{OH} \times [OH])$ in Fig. S3(b).

As suggested, we have added the total OH loss rate calculated from measured concentrations of OH and the measured OH reactivity to Figure S3a and also the net rate of production or loss, based on the measured reactivity, in Figure S3b.



For comment 1 by reviewer 2, I suggest including the monoterpene concentration in Table S3 alongside the isoprene concentration (if measurements were made). This could then be referred to during the discussion on modelled and measured nighttime XO_2 concentrations. It is not clear from the discussion currently if the models for the earlier campaigns were constrained to monoterpenes or not?

We have added monoterpene measurements to Table S3. The measured mixing ratios were similar in 1998, 2008, 2009, and 2016, but unfortunately monoterpenes were not measured in 1997 during the only other campaign in which total peroxy radicals were measured.

Although not measured at the site during the 1997 campaign, monoterpene mixing ratios observed in 1998, 2008, and 2009 were similar to measurements from 2016 (Table S3).

We have also added a reference to an additional study which compares the total peroxy radical measurements from 1997 to a model that includes reactive terpene emissions. The measured and modeled total peroxy radical concentrations in that study were very similar to our results from 2016. We've added this comparison that focuses on the discrepancy between the measurements and models at night to page 18 of the revised manuscript.

The RACM2 and MCM models overpredict the nighttime XO_2 concentrations by factor of approximately 4, with the RACM2-LIM1 model predicting mixing ratios of total peroxy radicals of approximately 27 ppt between 21:00 and 6:00 and the MCM v3.3.1 model predicting XO_2 mixing ratios of approximately 36 ppt during the night (Fig. 4) compared to the measured concentrations of less than 10 ppt. These results are similar to those from the 1997 PROPHET campaign in which measured XO_2 mixing ratios of 3–6 ppt were overpredicted by more than a factor of 10 by a model that included reactive terpene emissions (Mihele and Hastie, 2003; Sillman et al., 2002).

References

Sillman, S., Carroll, M. A., Thornberry, T., Lamb, B. K., Westberg, H., Brune, W. H., Faloona, I., Tan, D., Shepson, P. B., Sumner, A. L., Hastie, D. R., Mihele, C. M., Apel, E. C., Riemer, D. D., and Zika, R. G.: Loss of isoprene and sources of nighttime OH radicals at a rural site in the United States: Results from photochemical models, *J. Geophys. Res.- Atmos.*, 107, ACH 2-1-ACH 2-14, <https://doi.org/https://doi.org/10.1029/2001JD000449>, 2002.