Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-247

Anonymous Referee #2

Referee comment on "Diel cycle impacts on the chemical and light absorption properties of organic carbon aerosol from wildfires in the western United States" by Benjamin Sumlin et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-247-RC2, 2021

General Comments:
This manuscript investigates the dynamics of biomass burning aerosol optical properties (MAC) under different oxidation schemes. This authors pursue this investigation through use of a well-equipped mobile lab and oxidation flow reactor, which allows near in-situ sampling, aging, physical characterization, and chemical characterization of the target aerosol. Through investigating the plumes of two fires and their aging under two oxidation schemes the authors draw conclusions about how aging will change the optical properties of the observed aerosol. The authors conclude that nighttime (NO3.) aging generally leads to more absorbing aerosol and daytime (OH.) aging has more complex effects, which trend toward less absorbing aerosol for longer aging times.
Overall this short paper is well written, investigates a topic that is of pressing interest to the atmospheric community, and presents a unique application of oxidation flow reactors. The accurate constraints on aerosol optical properties, and how they change as they age, are key to accurate estimations of the earth's radiative budget and modeling of future climate systems. I recommend that this work be accepted once the minor issues I've elaborated on below have been addressed.

Specific Comments:
Line 12: These statements seem to over simplify the results. I recommend slightly restructuring the abstract to better present the detailed results the authors discuss in the manuscript. For example, reading the abstract only, I would believe that OH oxidation was only observed to be bleaching, whereas the authors observed a much more complex relationship. Similarly, the NO3 results were aging and fire dependent. This context should be included here if possible.
Line 246: Can the authors comment on the differences between the BBVOCs that drove these differences in MAC changes? The VOCUS data is used to investigate potential differences in the NO3 reaction rate, but it would be also interesting to use this data to investigate particular precursors which contribute strongly to the observed enhancements/bleaching.
Technical Comments:
Line 58: Line suggests investigations regarding the refractive index of the sampled aerosol, but the paper only includes mentions of MAC data.
Line 112: Small font error in reference
Line 239: Need to better define NO3, EXT class of variables. I think they are, are related

to, the NO3,REXT, but it is not immediately clear.