Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., author comment AC1
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Reply on CC1

Andrew J. Lindsay et al.

Author comment on "Ground-based investigation of HO_x and ozone chemistry in biomass burning plumes in rural Idaho" by Andrew J. Lindsay et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-702-AC1, 2021

Thank you for your comment. This is a valid point that we will fully address in the revision.

Fortunately, our ECHAMP peroxy radical sensor provides a separate measurement of Ox (Ox = O_3 + NO_2) which we can compare to the 2B O_3 measurements. In the ECHAMP inlet, ambient air is mixed with excess NO which reacts with O_3 to form NO_2 which is later quantified by an Aerodyne CAPS sensor based on absorption of light at 450 nm. Unlike the 254 nm absorption bandpass used by the UV absorption method, few compounds absorb in this blue region of the spectrum and so these positive interferences are expected to be minimal (Kebabian et al., 2008). In the attachment, we share a time series of both the 2B O3 and one of the CAPS Ox results. For a more direct comparison, we added NO_2 (measured separately by TILDAS) to our 2B O_3 measurement to generate concentrations of Ox. The 17 August period shown includes a non-smoke period followed by a smoke period that starts at about 15:30 local time. The CAPS instrument went offline for diagnostic purposes at 19:30. Organic PM mass concentrations increased from ~10 ug m^{-3} to 30 ug m^{-3} upon smoke influence. There is good agreement between the 2B derived Ox and CAPS Ox during both the smoke and non-smoke periods for both this period shown and for the entire campaign, indicating that interferences in the 2B Tech O_3 instrument were minimal. This is not surprising as the smoke plumes we sampled were more dilute than those considered by Long et al. (2021). Here, the smoke plumes led to CO enhancements of near 100 ppb, whereas the smoke plumes studied by Long et al. (2021) had CO concentrations of several parts per million.

References:

Kebabian, P. L., Wood, E. C., Herndon, S. C., and Freedman, A.: A practical alternative to chemiluminescence-based detection of nitrogen dioxide: Cavity attenuated phase shift spectroscopy, Environmental science & technology, 42, 6040-6045, 2008.

Long, R. W., Whitehill, A., Habel, A., Urbanski, S., Halliday, H., Colón, M., Kaushik, S., and Landis, M. S.: Comparison of ozone measurement methods in biomass burning smoke: an evaluation under field and laboratory conditions, Atmospheric Measurement Techniques, 14, 1783-1800, 2021.

Please also note the supplement to this comment:
https://acp.copernicus.org/preprints/acp-2021-702/acp-2021-702-AC1-supplement.pdf