

Unexpected long-range transport of glyoxal and formaldehyde observed from the Copernicus Sentinel-5 Precursor satellite during the 2018 Canadian wildfires

This paper presents satellite-derived observations of glyoxal and formaldehyde from the TROPOMI instrument, over British Columbia, Canada. Elevated column densities were associated with fire hot spots and observed over distances of up to 1500 km. Based on comparisons with FLEXPART simulations with different lifetimes, effective lifetimes of >20 hours are required to explain the observations. The authors indicate that the effective lifetimes are in contrast to the shorter expected lifetimes of these species.

My main concern with the paper is with the references to the lifetimes of glyoxal and formaldehyde. The paper does not provide adequate evidence to support the determination of atmospheric lifetimes, mainly because chemistry and deposition are not considered (and as the authors state, not within the scope of this paper). The observations of glyoxal and formaldehyde enhancements downwind of the fire hot spots are likely due to formation (and loss) processes (as the authors also note) and thus, reference to lifetimes accounting only for transport time is not appropriate.

This is a relevant paper for ACP and would be of interest to ACP readers. The paper is comprehensive, well written with clear study objectives, logically presented and articulated conclusions. The satellite-derived observations of glyoxal and formaldehyde far downwind of the fire sources are quite interesting and can stand on their own without comparison to 'expected' lifetimes.

I recommend acceptance to ACP after addressing the above comments and a few minor comments below.

L42: biomass burning includes wildfires – what is meant by indicating both?

L49: transported to 'those' regions – please clarify or reword

Intro – break into paragraphs for easier reading

L117 – any comment on the uncertainty associated with using an aerosol profile to depict the glyoxal profile?

L122 – what is meant by a homogeneous distribution? The same profile is used over the geographic region studied?

L131 – how much reduction is noise? Can this be quantified?

L132 – 'strong absorption of the latter'; of the latter not appropriate in this sentence, confusing. Remove 'of the latter' and clarify.

L150 – confusing sentence regarding lifetimes.....

L156 – 'exact emissions' ; what is meant by this? emission type (pollutant?) or emission rate?

L161 – reference should be in brackets

L218 – sentence strange; remove time of day because photon flux and OH is inherently dependent on time of day. Also dependent on wet/dry deposition processes and other oxidants.

L220 – should be' which are discussed in detail'

Section 4 – Typo in the title 'Conclusions'

L292 – 'highest' what? SCDs?

Table 1 caption typo, remove 'de'