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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Profiling of formaldehyde, glyoxal, methylglyoxal, and CO over the Amazon: Normalised excess mixing ratios and related emission factors in biomass burning plumes" *by* Flora Kluge et al.

Anonymous Referee #3

Received and published: 6 June 2020

This manuscript presents vertical profile measurements of formaldehyde, glyoxal, methylglyoxal, and O over the AMAzon during the HALO campaign (fall 2014) using mini-DOAS. The authors found enhanced concentrations of all four pollutants in air masses affected by biomass burning. They further calculated the normalized excess mixing ratios and relative emission factors of glyoxal and methylglyoxal from biomass burning. The normalized excess mixing ratio for glyoxal was in good agreement with other recent reports, but the value for methylglyoxal was variable and much larger than previous reports. Both of these values can be used in models to help interpret the

sources of glyoxal and methylglyoxal, which in turn helps with the analyses of satellite-based glyoxal measurements and the sources of secondary organic aerosols.

The thesis of the paper is very much of interest to the community. In addition to the well-documented measurements, I was particular interested to see the very thorough uncertainty analysis (Section 2.1) and the difference between the 'gross mixing ratio' and the 'normalized excess mixing ratios'. The paper is generally well written, clear, and quantitative, with no major flaws. There are some minor grammatic, spelling, and citation errors, but those are easy to fix. In all, I recommend publication of this paper after a minor revision.

Comments:

Lines 172-182: The writing in this paragraph is somewhat confusing. The statement of UV/vis limb measurements dividing the atmosphere in to three parts (a, b, and c) applies not only to O4 absorption but also to the absorption of the targeted species. But here the authors only discussed the implication for O4 absorption (i.e., b+c dominates, which is also true for the targeted species here). What are the implications for the retrievals of the targeted species?

Lines 194-197: "From the above discussion, ... volume.": Can the authors say something about the estimated size and orientation of this averaging air volumne?

Other minor comments:

Line 13: 'applaying' should be 'applying'

Line 31: Extra 'is' after C3H4O2*. Please remove

Line 52-69: Missing key reference for the global budget of glyoxal: Myriokefalitakis et al. (2008) Myriokefalitakis, S., M. Vrekoussis, K. Tsigaridis, F. Wittrock, A. Richter, C. Brühl, R. Volkamer, J.P. Burrows, and M. Kanakidou, 2008: The influence of natural and anthropogenic secondary sources on the glyoxal global distribution. Atmos. Chem. Phys., 8, 4965-4981, doi:10.5194/acp-8-4965-2008.

Lines 85-87: "In comparison to satellite ...biogenic precursors." This statement is missing references.

Line 241: Remove 'either of'

LIne 250: "several 100 m" should be "several hundred meters"

Figure 8 caption: "The colour coding in panels (e)), and (g)" should be "(e) and (f)"

Line 368: Extra ")" after "(Fu et al., 2008). Also, there was no budget analysis for formaldehyde in Fu et al. (2008). Please cite a relevant reference.

Line 733: Capitalize 'C' in Nature 'communications'.

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