

Interactive comment on “Observations of glyoxal and formaldehyde as metrics for the anthropogenic impact on rural photochemistry” by J. P. DiGangi et al.

Anonymous Referee #3

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The paper by DiGangi et al. describes in-situ measurements of HCHO and Glyoxal (Gly) during two field campaigns in rural environments. The ratio between these two species (R_{GF}) shows a pronounced diurnal cycle, independent of the absolute values of either Gly or HCHO, indicating a strong coupling between those two species. The authors argue, that the absolute level of R_{GF} depends on the origin of the VOC air matrix, differing between anthropogenic and biogenic VOCs. In their conclusion, they state that R_{GF} can be used to differentiate between anthropogenic and biogenic dominated VOC mixtures. Overall the data presented in the paper are highly interesting and deserve publication. Nevertheless, I feel that the paper could be significantly improved by addressing some points listed below:

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Instrumental details: If the authors attempt to use R_{GF} in a quantitative sense, more information on the data quality is necessary. A simple statement of the instruments detection limits is not sufficient. In particular, a calculation of the total measurement uncertainties for both HCHO and Gly measurements are mandatory for the reader to judge on the data quality. It would also be helpful to compare uncertainties with those of satellite measurements to judge on the significance of the describe differences between those two observations.

Data processing: In most of graphs Gly, HCHO and R_{GF} are given as binned data. The authors should provide more details on the binning process, e.g. binning intervals, is R_{GF} calculated from binned HCHO and Gly data, what is the standard deviation for one individual bin? Often, e.g. in Fig. 5 during BN3, it seems that the data bins for HCHO and Gly are time shifted. In particular for this event it would be useful to show high time resolution data for HCHO and Gly in addition to R_{GF} in Fig. 6.

Diurnal variation: As mentioned above a major finding of the study is the strong and persistent diurnal variation of R_{GF} . Unfortunately, the authors hardly address the chemical reasons for the diurnal change of the ratio. Any ideas, what causes the ratio to change?

Biomass burning: The authors state that there are unexplained differences for the two biomass burning plumes that might be due to emissions during different stages of the fire. It is often observed that emission vary between flaming and smoldering phases of fires. Is there any information for this particular fire about flaming or smoldering phases, that could help explain the difference between those two plumes?

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