We thank the reviewer for their helpful questions and comments. The original reviewer questions and comments are shown in italics, while our responses are shown in plain text.

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:

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.

The overall R_{GF} accuracy, ~36% limited by calibration accuracies of HCHO and Gly, does not limit the major points of this manuscript. We have added the below discussion of the accuracy and precision in both the HCHO and Gly measurements, as well as R_{GF}.

"Calibration uncertainties (accuracies) were 20% for Gly and 30% for HCHO during both campaigns. Sixty second median precisions for Gly measurements were 8.9% and 11.5% during BEARPEX and BEACHON-ROCS, respectively, while thirty second precisions for HCHO measurements were 11.1% and 0.37% during BEARPEX and BEACHON-ROCS, respectively. This results in an R_{GF} accuracy of ~36% and R_{GF} median precisions of 15.6% and 11.6% during BEARPEX and BEACHON-ROCS, respectively."

An intercomparison of Gly data currently in preparation will confirm this accuracy within 20%. Unfortunately, uncertainities are not available for the satellite measurements referenced in this work, though direct satellite and ground intercomparisions of Gly, HCHO, and R_{GF} during these campaigns are a current subject of investigation. Finally, it should be noted that uncertainties in the absolute accuracy of either Gly or HCHO do not affect the trends observed during the transport events.

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?

Addition of the standard deviation, which is used in this manuscript as a measure of precision, for R_{GF} bins was seen as overcrowding of the figures, but we did add a discussion of typical values in the aforementioned section on accuracy and precision, as quoted above. Additionally, we added an example figure in the supplement (Fig. S12), which shows the Gly, HCHO, and R_{GF} precisions during each event.

Often, e.g. in Fig. 5 during BN3, it seems that the data bins for HCHO and Gly are time shifted.

We thank the reviewer for pointing out this error. We have remade Figures 2, 3, 4, 5, 6, S5, S8, S9, S10, and S11 so that the data for all species have been binned to the same timeseries and have explicitly stated the binning intervals and methods.

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.

We felt that in Fig. 6, adding Gly and HCHO high time resolution data also resulted in an overcrowded figure, so we have altered Fig. 6 to show the previous version of the figure in the upper panel and high time resolution HCHO and Gly data in the lower panel.

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?

Currently, we have two non-exclusive theories of the cause of lower nighttime R_{GF}: a buildup of directly-emitted HCHO into the stable nocturnal boundary layer and preferential dry deposition of Gly over HCHO. At this time, we do not have the necessary data to validate either of these theories, but this is the subject of future studies. We have added the following sentence summarizing these hypotheses at the beginning of Sect. 3:

"Thus, the consistent diurnal variability in R_{GF} is possibly due to either a buildup of directly-emitted HCHO into the stable nocturnal boundary layer or preferential dry deposition of Gly over HCHO, though current data is insufficient to verify either of these conclusions."

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?

Unfortunately, little data seems to exist for what was actually a small and easily contained fire, so we are purely speculating on this point. However, we have added the following sentence about studies which have observed differences in flaming vs. smoldering phases, and we thank the reviewer for mentioning this point.

"However, this influence may be dependent on environmental factors, including flaming vs. smoldering phases, which have been shown to exhibit substantial differences in VOC formation rates (Andreae and Merlet, 2001;Koppmann et al., 2005).

References:

Andreae, M. O., and Merlet, P.: Emission of trace gases and aerosols from biomass burning, Global Biogeochem. Cycles, 15, 955-966, 2001.

Koppmann, R., von Czapiewski, K., and Reid, J. S.: A review of biomass burning emissions, part I: gaseous emissions of carbon monoxide, methane, volatile organic compounds, and nitrogen containing compounds, Atmos. Chem. Phys. Discuss., 5, 10455-10516, 10.5194/acpd-5-10455-2005, 2005.