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Discussions

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Interactive comment on "On the zero-level offset in the GOSAT TANSO-FTS O$_2$ A-band and the quality of solar-induced chlorophyll fluorescence (SIF): Comparison of SIF between GOSAT and OCO-2" *by* Haruki Oshio et al.

Christian Frankenberg (Referee)

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The study by Oshio et al presents an in-depths analysis of instrumental effects of the GOSAT FTS instrument and its effects on SIF retrievals from space. The 0-level offset effect in FTS system has been previously found to have a major impact on SIF retrievals (as well as trace gas retrievals in general for that matter), so the topic is warranted and suitable for AMT. In general, I find the paper to be well written and comprehensive and I recommend publication in AMT after some minor (some may be a bit more involved) concerns are resolved. Even though there are no really new scientific results, the

technical nature of the submission and the journal should alleviate this concern.

Big picture concerns:

In general, I see the problem mostly as a problem of noise, which makes a conclusive statement often impossible. The different choices for reference regions yield dramatically different numbers of retrievals, resulting often in rather high standard errors (due to the low data rate from GOSAT). In many case, differences are thus not significant and there are a number of plots for which I don't really see the point. This holds for Fig5: What do I really see here? It all seems noisy and it is unclear whether (and why) any specific patterns are reliable. Fig 6: This looks like a shot-gun blast, from which I don't learn anything, Can you co-add by OCO-2 SIF bin and then plot aggregated data? Single soundings are often meaningless unless averaging is applied. Fig 7 (Differences between OCO-2 and GOSAT seem to be all within +/- 2 sigma, so no conclusions can be drawn). Figs 11/12: Again, not really too clear patterns here. I think some of the plots can be omitted and the story streamlined to the major aspects. The discussion should include whether any patterns are statistically significant (or not)

Given that the problem in the right 0-level offset correction is that it is noisy, a primary goal would be to have as low of a standard error in the 0-level offset per radiance bin and temporal bin. The authors could put some more effort into discussing this aspect and which analyses might help (e.g. temporal and radiance bin smoothing, etc). Eventually, the differences they see for the various procedures might be mostly within the noise

Specific comments:

P3, Line 28: Is the Low gain actually used? Also worthwhile to mention that OCO-2 can use the Sahara as a reference while GOSAT can't, as the gain changes. Again, this increases noise in the correction for GOSAT.

P4/L8: Why was 771nm not retrieved? It would reduce noise in final SIF data

P5/L6: Please add Sun et al Science publication here

P6/L24: Why did you choose these radiance bins exactly? (vegetation is often brighter). Is there a difference in mean radiance for all methods in Figure 1 (you have the selected min/max selection but you might not sample the same radiance averages, would be good to look at that as well. Also, we found that this radiance bin is less time dependent as lower radiance.

P9/L28: Is the SI figure plotted at a bin of 0.00003V/cm-1? If yes, it seems to coarse as some of the features we found in GOSAT data are highly dependent on radiance level and might warrant finer sampling. In your SI figure, it seems too coarse.