Dear Referee #1,

Thank you for this second review of our manuscript. We agree that it was not clear from the previous version of the manuscript why 271 ms was chosen as integration time for this study. Therefore, we added both suggested figures to the manuscript with their description in the appendix which we hope are helpful in understanding these issues. Please find our point-by-point responses below.

Best regards and on behalf of all authors,

Michael Weimer

Thank you for the detailed explanations in your answers. The additional analysis you have performed on discarding the entire swath if a part is saturated is very valuable. This gives a more realistic estimate of the remaining usable data. Do you also have a percentage for the data available after postprocessing for this case? It might be worthwhile adding this number if you have it readily available.

Authors' Response: We added the suggested panels to the figure and added a short explanation to the sentence describing the figure in the main text.

In your rework you have addressed many of my points in a satisfactory way. However, on the sampling interval/integration time discussion I still miss some fundamental information:
While acknowledging that there are constraints from mission requirements and hardware, it is also important for a scientific study to show very clearly what the fundamental limitations are in such a situation. This analysis is needed to make sure that the best choices and tradeoffs between the different requirements can be made for this mission. A possible non-compliance on the spatial sampling might be acceptable if the SNR and coverage could be improved significantly.

I do not fully follow the argumentation in your answer, of course the signal decreases if a shorter integration time is used, but when comparing the case for OSF=2, an exposure time of 234ms surely has a higher SNR than 2* 117ms? The total integration time is the same, but with two reads there will be twice the read-out noise and also a gap in the spatial sampling due to the read-out time.
So please add to your manuscript (without consideration for the prescribed values for the integration times) a table or curve with the integration time vs % of saturated pixels. What would be the optimal integration time for the CO2/NO2 instrument to avoid saturation? For SWIR 1 24.51% (value from Table 2) of the pixels are saturated for 271 ms, when would it be 10%, 5%, 1%? And what SNR would be expected then for NIR/SWIR1/SWIR2?

Authors' Response: We thank the referee for providing more detail in their concerns about the integration time issue. We calculated the A and B parameters for all sampling periods between 0 and 400 ms. We added the figure and the details of the description to the manuscript as another appendix. In summary, the fraction of global spatial samples that are affected by saturation increases from zero to about 40 % between sampling periods of 150 to 400 ms and OSF1. For larger OSF values, this fraction is smaller, as expected. The expected average SNR increases

with larger sampling periods, therefore a sampling time is used that is a trade-off between small fraction of saturation and largest SNR.