

***Interactive comment on “Thermal and near-infrared sensor for carbon observation Fourier-transform spectrometer-2 (TANSO-FTS-2) on the Greenhouse Gases Observing Satellite-2 (GOSAT-2) during its first year on orbit” by Hiroshi Suto et al.***

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General Comments

“Thermal and near-infrared sensor for carbon observations Fourier transform spectrometer-2 (TANSO-FTS-2) on the Greenhouse Gases Observing Satellite-2 (GOSAT-2) during its first year on orbit by Suto et al. describes the on-orbit performance of the TANSO-FTS-2, launched in October 2018. Due to the similarities be-

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tween GOSAT and GOSAT-2, much of the paper clarifies the differences in design and performance relative to TANSO-FTS on GOSAT, which is useful for readers interested in calibration issues or simply for informed data users. However, one truly novel aspect of GOSAT-2, which is not described anywhere else in the scientific literature is intelligent pointing. I think it would be valuable to expand this brief section of the manuscript with some more detail about the intelligent pointing approach and implementation as well as the results. With such a large fraction of data lost due to clouds with standard observing (and post-processing cloud filters), the factor of 1.8 improvement in coverage is interesting, yet potential for further improvement can only be assessed if a little more detail were to be provided. Overall, with this issue addressed and the specific points below, this paper should serve as a useful reference for the performance of TANSO-FTS on GOSAT-2.

#### Specific Comments and Technical Corrections

Line 1-2: Should not have dash on “Fourier-transform” in title.

Line 21-23 and throughout paper: Greek letter mu should be used instead of u.

Line 23: 0.20 cm<sup>-1</sup> is the spectral sampling interval, while the spectral resolution of the instrument line shape relates to the observed full width at half maximum and will be at least 1.2 times the spectral sampling interval.

Line 38: “UNFCCC” not “UNFCC”

Line 75: It would be useful if the authors would comment on the mass and/or size of the spacecraft since there is nothing in Figure 1 to allow a reader to gauge the scale, for example, no person in the image.

Line 81 and throughout: Should replace “deg” with ° throughout the paper

Line 93: Please clarify if the ‘turnaround time’ is for the interferometer scan arm or if it is related to pointing.

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Line 120: It would be useful to state either the size of one CMOS camera pixel on the ground or the full field of view size. Furthermore, what wavelength range does the CMOS camera cover?

Line 125: “effective aperture size” is stated but is this somehow different from the true aperture size?

Line 140: Should read “9.6 km diameter”

Line 144: Rather than repeating the spectral regions in the text when they are already in Table 2, the text should just refer to Table 2. It would be useful if Table 2 also listed the GOSAT bands for comparison as was done with orbits.

Line 215: The SNRs between the S and P polarizations are surprisingly different. Is this due to the detectors not being identical or something else?

Line 273: Mentions nadir and many calibration modes. What about glint? Does nadir here actually mean any Earth scene observations?

Line 331: phase-corrected

Line 341: “gauss” should be “Gaussian”

Line 485/504: Temperature difference should not be given in %. It is much better to use absolute units (K).

Line 517: While the small mean offset is encouraging, the authors should comment on the factors contributing to the standard deviation of the offset (0.17 km latitude and 0.18 km longitude) which is not entirely negligible.

Line 529: 0.2 cm<sup>-1</sup> is the spectral sampling interval (see comment for line 23)

Line 529-539, Figure 6 and Figure 17 – A band (12950 and 13250 cm<sup>-1</sup>) is very asymmetric. Is this mainly attributed to optical misalignment and was this present in pre-launch testing or only present on-orbit?

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Line 552: Is the same CMOS camera mentioned earlier used for the cloud identification or is this a different camera? This should be clarified in the text. In either case, some details should be provided like spatial resolution and FOV dimensions. How long does it take to process the image onboard in real time?

Line 560-564: While S, M and V are defined by equations 13-15, do they have any descriptive interpretation. What are units or typical range of the raw pixel measures?

Line 635-714: References should be listed alphabetically, but O'Brien et al and Parker et al are not.

Table 5. Table should be simplified since the wavenumber for the p and s polarizations of each band is exactly the same (to the precision given).

Table 7. It should be specified that this is the ratio of radiance for GOSAT-2/GOSAT.

Figure 14 – It would be better to say “AIRS” than “Aqua” since each Aqua instrument would have a different viewing pattern.

Figure 18 – Residuals in oxygen band seem indicative of a poor fit. The authors should comment on this.

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