

Interactive comment on “The On-Orbit Performance of the Orbiting Carbon Observatory-2 (OCO-2) Instrument and its Radiometrically Calibrated Products” by David Crisp et al.

Anonymous Referee #2

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Comments on The on-orbit performance of the Orbiting Carbon Observatory-2 (OCO-2) instrument and its radiometrically calibrated products by David Crisp et al

Overall comments: This paper describes how the radiometrically calibrated data products on-orbit from OCO-2 were determined. The paper is quite comprehensive and provides an excellent view of the calibration work the OCO-2 team has accomplished. Details are often not provided, but reference is made to a submitted paper by Rosenberg in which those details are presumably discussed. As expected, no science data is presented. Although some of the comments below are substantive, most of the comments are fairly trivial in nature. This paper is a valuable reference paper for use of the OCO-2 L1b and L2 data. Recommendation: accept subject to minor revisions as

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noted below.

Specific comments:

general: - you should state what the absolute radiometric calibration goals were for OCO-2 and if those goals were met. You really only discuss relative calibrations and changes in the text. Details are likely in the Rosenberg paper, but a short paragraph would be valuable to set the stage for the reader

- you discuss briefly the ILS, perhaps expand that discussion and show a graph of the determined ILS for each channel since potential changes to the ILS are critical to "on-orbit performance of OCO-2".

specific:

1/21 "These" are particularly . . . ; Remove "the"; spell "observatons" correctly

2/13 changes "in" the line core

15 the implication here is that there is a single spectrograph with 3 detectors in the focal plane, rather than 3 separate spectrographs. This is an important distinction due to scattered light considerations.

18 sensitivity add "(s/n > 400)"

20 remove terminology "full-physics". Say "detailed" or some such word if you want to emphasize its technical ability. Full physics is not very meaningful – can never be full physics

25 in the (), aren't these reversed relative to line 24?? The detectors should be coldest?

3/16 a "common" relay optics assembly

/18 perhaps add the level of rejection by the narrow pass filter

/21/22 the statement regarding the alignment of the 3 polarizers leaves open the pos-

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sibility that the polarizer axes are not co-aligned since the spectrographs may have rotated polarization sensitivities. Please clarify.

/23 "a" spectrometer slit

/26 might want to mention level of thermal emission as a fraction of the continuum level in each channel?

/28 mention that only 160 pixels spatially are illuminated so the caption to figure 2a is more easily understood – only part of the spatial direction of the FPA is utilized

4/2 "returned as unilluminated reference pixels"

/11 "to" the FPAs

/19 might want to expand on the lack of need for a physical shutter. After readout, are the pixels reset to zero, or is there a potential memory effect due to residual charge

/24 replace "for" with "during" since this mode is only used occasionally

5/7 add to the list of mrad and deg, the projected size on the ground in km

6/12 really the measurement is of the absolute radiometric response of the instrument with any changes in the solar diffuser embedded in that measurement, as you note on line 21

9 the discussion at the top of pg 9 is confusing. 8/24 states dark offset of each pixel is sensitive to small (mK) changes in the temp of the FPA, whereas top of pg 9 states that the "dark offset is relatively insensitive to temperature". L3 states that a few samples have much greater temperature sensitivity (Fig 6). Fig 6 graphs are fairly clear, but what are the well-behaved and temp-sensitive samples? Why are some samples more sensitive than others? This is confusing.

/21 relative "to" the OBA

11/5 is it possible to quantify "measurable amount" in km projected at the surface of the

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Earth?

/6 please give the indicated "specification" for alignment in km projected at the surface of the Earth

/8 add in parentheses the half size of the OCO-2 footprint in km

/30 which was – add space

/18 why are not gain corrections applied to individual pixels prior to incorporation? If because so small the weighting does not matter, state that.

12/26 does this mean that previously pixels labeled as bad were changed to be labeled as OK?

15/6 "v"7

16 you refer to figure 12 for the first time in L24, but before that refer to figs 13 and 14. Numbering of figs?

/24 might be interesting to give the angular rotation of each of the 3 channels – Figure 12 shows the angle to be nontrivial

17/21 do you mean screened "out"?

/32 "wavelength" dependent polarization

20/26 the "science" aperture is mentioned. Not entirely clear what this means. Perhaps change the sentence to read "These measurements are made in the normal Earth-observing mode without the solar or lamp diffusers in place and indicate"

21/4 how is it independently concluded that the lamps are decreasing in output since what is observed is the combination of lamp/diffuser that is actually observed?

/24 might want to note that the data products go back to October 2014 and not give the impression it is only from June 2015

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22/10 might want to include a few words on bias correction
27 in Figure 2 caption, please give the spatial resolution of a super pixel
27 in Figure 2 you might want to note that columns are horizontal in this figure and rows are vertical. This is initially confusing while trying to digest this complicated figure since it is opposite of what one normally considers a column and a row.
30/ you might want to put horizontal lines on Fig 5 to show minimum required s/n for each channel for a single sounding
31/ L4,7 – the definition of “training range” is unclear here and on 9/2
32/ grating tilts not grading tilts?? Shifts not sifs. No label on RH ordinate ($^{\circ}$ C?) – looks cut off in pdf version?
33/ why are the bad pixels concentrated on the RHS?
34/ Fig 9 – last sentence, “right hand edge” as assume you mean the * that are just flat with L1b column?
37/ Fig 12 – might be nice to list the angular tilt of each band
39/ Fig 14 (b) – might want to comment on why columns around 179 wavenumbers are not chosen in a flat continuum region??
40/ tell the reader why the SCO2 channel is not properly corrected (cloud?) – not explained in text 17/20
42/ Fig 17 – add to the caption 18/23 - Note that SNR values near 200 are needed to yield XCO2 estimates with single sounding random errors less than 1 ppm.
43/ Fig 18 L2 – all data are referenced “to” the
the figure is labeled “solar, lunar, and lamp 2 mean”, but in the symbol label on the lower LHS, there is no symbol for lunar data, nor is lunar mentioned in the caption; it is discussed in the text

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