

## ***Interactive comment on “The ACOS $X_{CO_2}$ retrieval algorithm, Part 2: Global $X_{CO_2}$ data characterization” by D. Crisp et al.***

**D. Crisp et al.**

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Received and published: 10 February 2012

We thank the referee for their useful comments. We have attempted to address each below.

Section 1, page 5, line 24: Please add one sentence explaining why B2.9 is preliminary (ongoing optimization of the post-processing filtering as explained rather late in the manuscript in Sect. 7).

- We added the sentence "These results are “preliminary” because the final pre-and post-processing filters for this product are still under development."

Section 2.1, page 8, line 7: Explain IMC.

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- IMC is defined as “Image Motion Compensation” in the paragraph above (Line 25, pg 7). Did the reviewer miss this definition, or are they requesting an explicit description of how it is implemented? In any case, we modified the sentence on pg 7 as follows: “It also provides image motion compensation (IMC), pointing the instrument aperture at a fixed surface location during individual 4-second interferogram scans.”

Section 3, page 12, line 10: Please explain “diverging steps”.

- We added the parenthetic phrase “(i.e. where chi2 increases from one iteration to another)”

Section 5.2, page 16, line 13: I would be helpful to refer to Tab. 1 when mentioning the WCO2 band. - Done

Section 5.2, page 18, lines 7-9: Is this statement also true for neglecting chlorophyll fluorescence ? Please provide some evidence, if possible, or consider modifying the statement.

-The confusion here may have been introduced by the erroneous reference to Frankenberg et al. 2011b instead of Frankenberg et al. 2011a. A primary conclusion of the 2011a paper is that the neglect of chlorophyll fluorescence can introduce errors in O2 A-band retrievals. We made this correction in the text.

Caption Table 1: As capital letters are used for “Spectral Ranges” I recommend to also use capital letters for “Spectral bands”.

- We decided to use small letters for both “spectral ranges” and “spectral bands”.

Table 4: Please explain “Outcome” shortly in the caption and (if necessary) in more detail in the main text.

- The term (convergence reached) was added in table 4 and the “bad” column was modified to explicitly define the criteria that failed (3 – Exceeded iteration limit, 4- Exceeded diverging steps limit)

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Caption Fig. 15: Is delta XCO2 corrected minus uncorrected ? Please add this information.

- Caption changed to state "Increase in XCO2 produced by correcting the ILS interpolation error recently identified in the B2.8". - Caption Fig. 17: Last sentence: Please remove one of the two "the".

- Done

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