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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "The Orbiting Carbon Observatory-2: First 18 months of Science Data Products" *by* Annmarie Eldering et al.

**Annmarie Eldering et al.**

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From the author: We appreciate the time investment that anonymous referee #2 made to review our paper. We carefully considered all of the comments and have responses to each. We agree with their assessment that the paper is limited in novel science findings, but will serve as a valuable reference, and we are grateful that they understand this about the scope of the paper.

I have some comments/suggestions, mainly related to section 5 that the authors should address. There is also a number of minor corrections that need to be applied.What is the reason of showing the growth rate per latitude as figure 12 seems to show very little latitudinal difference. Can you please discuss what you would expect to find and what you do see from OCO-2. What can we learn from the comparison of column



data from OCO-2 to Manu Loa in-situ data? Both don't agree very well (eg for Sep the difference is almost 1 ppm) so I don't understand if you try to say that OCO-2 data shows a reasonable growth rate or not. At least, you could select only OCO-2 data around Mauna Loa. Clearly, much more useful would be a comparison to the growth rate from OCO-2 data a TCCON station.

Response: We have considered the reviewer's comments, and agree that we just touch on a rich topic here. I have added citations to more complete work on this topic, and restated our message, that for a first look, the OCO-2 growth rates are reasonable – ie, we should look further, and not abandon the project now.

Very similar questions apply to figure 13. This is an 'apples to oranges' comparisons. I think it would be useful to add column data from a model constraint with in-situ data such as CarbonTracker or CAMS so that proper column to column comparisons are possible.

Response: We appreciate this comment. We did some analysis with a modeling group as we developed the paper, but concluded that the model OCO-2 comparison is a large topic that merits a separate publication. In addition, there is a lot of variability from model to model, so including just one model result is not telling the whole story. Both reviewers had comments about this figure, focused on the 'apples to orange' comparison of total columns and surface measurements. It would be significant additional scope to discuss the vertical distributions, averaging kernels, and how to properly compare the surface data to the total columns. Therefore, we have decided to limit this discussion to just OCO-2 data, showing a weekly timeseries and pointing out the standard deviation of the OCO-2 data relative to the changes in time. We have also improved the time axis on the graph and pointed to the TCCON timeseries in the Wunch et al. (2016) paper.

Also, figure 14 does not add much value as no context is given. Adding data from a model to the figure (see above) would allow to gauge if the OCO-2 is roughly consistent

with expectations.

Response: Based on your comments and the comments of another reviewer, we have decided to eliminate Figure 14 from the paper. You are correct in that more detailed are needed to explain what we have learned and what questions remain about the observed gradients, and we will leave that to later publications.

Minor comments:

p.1 : Correct the assignment of affiliations of authors

Response: This has been done.

p.2, l. 9: For mass balance. . . -> For mass balance reasons. . .

Response: This has been done.

p1. L. 34 measure atmospheric CO2 with -> measure atmospheric CO2 columns with

Response: This has been done.

p.5 l. 35: error of 4% will impart an XCO2 error of 0.22 ppm, 0.12 ppm, and 0.4 ppm -> Connor et al., AMT, 2016 seems to suggest a much larger error in CO2 as a result of 4% radiometric uncertainty. How did you calculate this CO2 error?

Response: We added a statement about the sensitivity calculation that was used to derive this.

p.6 (optical depths less than âĹij0.35) -> does this refer to the retrieved optical depth which must not agree with the true optical depth?

Response: This is clarified in the paper – it refers to the OD from the prescreeners.

p.7 SNR design requirements were 290, 270, and 190 at nominal radiance levels -> please give the nominal radiance levels

Response: The nominal radiance levels are now included in the paper.



p.9 eq. 4-1: y, x, F, e are vectors and should be given in bold or use index to show that this is a sum over elements of the vector. Vector should be given in bold in the following paragraph as well. Also, define n.

Response: This has been done.

p. 11 l. 19: selected glint water data only -> selected glint data over water only

Response: This has been done.

p. 11, l.19 175 W to 130W in longitude, and from 15N to 25N -> 175ËĘo W to 130ËĘo W in longitude, and from 15ËĘo N to 25ËĘo N

Response: This has been done.

p. 17, l.5: retrieval -> retrieval

Response: This has been done.

p. 17, l. 5-8: There are 2 references labelled O'Dell et al., 2016 Can you confirm that Fig. 6-9 show the same coverage as Fig.. 3-5. It looks different but this might simply due to the different figure size.

Response: Yes, the reviewer is correct, this is an artifact of the scale of plotting.

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