**Atmospheric
Measurement
Techniques**
Open Access
Discussions

Interactive
Comment

Interactive comment on "Assessing 5 years of GOSAT Proxy XCH$_4$ data and associated uncertainties" *by* R. J. Parker et al.

R. J. Parker et al.

rjp23@le.ac.uk

Received and published: 16 September 2015

We would like to thank Referee #1 for their help and constructive comments in reviewing our submission. We are extremely grateful to them for taking time to provide feedback and have addressed each of their comments below.

General Comments:

Please write somewhere in the manuscript if the XCH4/XCO2 ratio component of the proxy retrieval (without model XCO2) and the uncertainty associated with the model XCO2 are part of the product.

Both of these quantities are provided in the data products to the end-users and we will

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

make this clear in the text.

Please comment on the compatibility of the assumption that the a posteriori error reduces with the square root of the number of soundings with the XCH4 model assumptions being used when assimilating satellite data (see also specific comments).

See below

Specific comments:

Page 5939 Lines 4-7: Please use the same number of digits for the percentages of the biases (0.27% vs. 0.3%).

Done

Page 5939 Lines 17-20: Please highlight the assumption here that the a posteriori error reduces with the square root of the number of measurements.

Text amended to highlight this assumption.

Page 5945: Please add an additional table with the XCH4 validation results showing the comparison statistics for each TCCON site similar to Table A1.

We initially felt that it was not necessary to include this as Figure 2 provides an overview of this information but we will now include it for completeness.

Page 5946 Lines 14-16: Please provide the spatial resolutions of the models and the time intervals they cover.

The text has been amended to include this information.

What is done when no model data is available? For example there is no CT2013B data for the year 2013. How is the ensemble approach affected by the different spatial resolution and temporal coverages of the individual models?

When no model data is available, the previous year is used and increased by the NOAA

annual global growth rate. There will continue to be an issue with model availability, hence the reason only three models are used in the ensemble and even these do not always cover the full time period required. The text has been amended to clarify this and also to highlight where the temporal coverage may cause issues.

Page 5947: Please also discuss the station-to-station biases and the share within the median model XCO2 for each model when evaluating if there is one model which most accurately represents the true atmosphere.

The text has been amended to include information relating to the model "share" of the median.

Page 5948, Line 14: Why is the uncertainty larger for the latter years? Is this related to not all models being available for the latter years?

We believe this to be a combination of model availability for the latter years and the divergence of the models over time for some regions which are not well constrained.

Page 5949 and Figure 6: That the a posteriori error reduces with the square root of the number of soundings is an important assumption in assessing if information will be provided to the inversion. Is this also assumed in the MACC XCH4 model when assimilating satellite data? Please elaborate on the model inversion and if the 1/sqrt(N) assumption is compatible with the assumptions used in the model to assimilate the satellite data. It would also be interesting to see time series of N and the a posteriori error without division by sqrt(N).

The assumption that the a posteriori error reduced with sqrt(N) is the "best case" scenario, with the reality being that it will reduce somewhat less than this. As we are trying to determine the significance of the model XCO2 component to the total contribution we felt that taking the best case for the a posteriori error uncertainty was the most sensible approach. If the error does not reduce as much, the model XCO2 component would then contribute even less to the total. This assumption is also consistent with

how inversion systems typically treat the uncertainty on the satellite data. We would be happy to provide the requested plots as supplementary material if that is required.

Page 5953, Lines 19-22: Please use the same number of digits for the percentages of the biases (0.27% vs. 0.3%).

Done

Page 5954, Line 9: Please highlight the assumption that the a posteriori error reduces with the square root of the number of soundings.

Text amended to clarify this.

Figure 1: Please explain why the sampling changes between Summer and Autumn 2010.

Text amended to include this. Due to instrumental issues, GOSAT changed their pointing pattern in August 2010 from 5 across-track points to 3 across-track points.

Figure 6: Please replace "a posteriori error is a random error" by "a posteriori error is assumed to be a random error".

Done

Table A1: Please add station-to-station biases, mean precision and share within the median model XCO2 used in the final proxy XCH4 for each model.

Table amended to include these values.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 5937, 2015.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper