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## ***Interactive comment on “Improvement of the retrieval algorithm for GOSAT SWIR XCO<sub>2</sub> and XCH<sub>4</sub> and their validation using TCCON data” by Y. Yoshida et al.***

**Anonymous Referee #1**

Received and published: 1 March 2013

The paper "Improvement of the retrieval algorithm for GOSAT SWIR XCO<sub>2</sub> and XCH<sub>4</sub> TIR and their validation using TCCON data" of Yoshida et al., submitted for publication in AMT, covers an important topic highly relevant for AMT. The paper is very well written, with good Figures and Tables, and contains important and interesting new material not published so far. I strongly recommend publication after the (mostly) minor items listed below have been addressed by the authors.

First of all I would like to congratulate the authors for this manuscript which documents the significant progress which has been made concerning improvements of the official retrieval algorithm of GOSAT. I am confident that this paper is a key reference for user

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My main point is the following: The abstract lists the mean systematic biases relative to TCCON. While it is good to know that also this error has been improved, it is not of critical importance for the surface flux inverse modeling applications, as constant biases can relatively easily be accounted for. What is more critical are regional biases. This is not mentioned in the abstract but in the text on page 963 line 10 and following. There is it mentioned that a “relative regional-scale accuracy” of 1.05 ppm has been achieved for XCO<sub>2</sub> and 6.8 ppb for XCH<sub>4</sub>. This should be highlighted in the abstract as this is directly related to GOSAT requirement of 1% relative accuracy. Seems this requirement has been met with the described version of the L2 products. If yes, this should be mentioned in the paper including a more detailed discussion. I also recommend to show in Table 2 which numbers result from computing the standard deviation of the biases at the various TCCON sites as an estimate of relative accuracy. The mean bias is reported in that table but not the standard deviation, which I think is more important. In this context it would also be important to discuss the validation results in the context of publications describing similar efforts but using other algorithms. Do the various algorithms / products agree or not? This needs to be discussed.

Concerning Table 2: Please add if the averages have been obtained by weighting with N or not. Please also explain why the Ns are different for the same TCCON site when different versions of the TCCON data have been used for comparison.

Page 954, line 17: “are therefore” -> “is therefore”.

Page 957, line 5-6: “and we assumed there to be no-aerosols”. Please replace by, e.g., “and we assumed aerosol free conditions for these scenarios” (or equivalent).

Page 958, line 17: Please quantify “small changes in the viewing angle”.

Eq. (3): Are “ao, a1, and a2” three constant values ? If yes please report the numbers.

Page 961, line 8-9: Replace “does not refer the sun-glint flag” by “does not use the

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sun-glint flag" or equivalent.

Page 961, line 25: "strictest ... filter is the AOD": What about cirrus ?

Page 962, line 10: "other month" -> "other months".

Page 962, line 12: Please add "CO2 emissions due to" before "fossil fuel consumption".

Page 962, line 22: "in cloud-free scenes" -> "for cloud-free scenes".

Page 965: "there still remain the ... differences" -> "Differences due to ... still remain" or so.

Page 965, line 6: "More ... analysis ... is needed"

Page 965, line 13: "Ha Tran"? Please check.

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 949, 2013.

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6, C150–C152, 2013

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