Atmos. Meas. Tech. Discuss., 3, C2196–C2198, 2010
www.atmos-meas-tech-discuss.net/3/C2196/2010/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval algorithm for CO₂ and CH₄ column abundances from short-wavelength infrared spectral observations by the Greenhouse Gases Observing Satellite" *by* Y. Yoshida et al.

Anonymous Referee #1

Received and published: 9 December 2010

The manuscript "Retrieval algorithm for CO2 and CH4 column abundances from short-wavelength infrared spectral observations by Greenhouse Gases Observing Satellite" from Yoshida et al. is the first detailed manuscript submitted to a peer-reviewed journal where the operational retrieval algorithm for GOSAT is described. It therefore covers an important topic which is highly relevant for AMT. The paper is well written and I recommend its publication in AMT after the comments given below have been considered by the authors.

Abstract: It is stated that certain GOSAT results "agree well with the current state of knowledge" although no detailed evidence for this statement is given. I recommend to show at least model conparisons (as the authors have pointed out that a comparison with independent measurements will be shown elsewhere), e.g., using the NIES TM model which is used for the CO2 and CH4 a-priori profiles.

Introduction, page 4794, line 25: The sentence as written gives the wrong impression that SCIAMACHY CO2 will not be precise and accurate enough for flux estimation. This however only refers to a certain data product (the product of Schneising et al., 2008) and this product may improve in the future e.g. using an improved version of the WFM-DOAS algorithm of Schneising et al., 2008, or using another algorithm such as the one of Reuter et al., 2010. This statement needs to be modified to take this into account.

Introduction, page 4795, line 13: What is the difference between the different versions of the Level 2 algorithms ? Please add this information.

Introduction, page 4795, line 18 and following: The statement that the (standard) DOAS method works well when the measured signal is transmitted direct solar light is not correct. Standard DOAS strictly speaking requires essentially that the logarithm of the radiance (or transmission) can be expressed as a linear combination of (differential) gas absorption cross-sections plus a low order polynomial. This requires that the differential optical depth is "small enough" (or if not that this can be somehow been considered e.g. by using appropriate airmass factors) and that the absorption cross-sections do not depend too strongly on temperature and pressure and that the absorption lines are resolved by the instrument. Therefore for line-absorbers such as CO2 and CH4 the standard DOAS method can typically not be used even if the measured signal is transmitted direct solar light.

Introduction, page 4795, line 22 and following: The CO2 proxy method for SCIAMACHY XCH4 retrieval of Frankenberg et al., Science, 2005, needs to be cited. The

AMTD

3, C2196–C2198, 2010

algorithm deals with aerosol issues by using the CH4 to CO2 column ratio.

Section 2.1, page 4797, line 12: Does this mean that uncalibrated TANSO-FTS data have been used for this manuscript ? Please clarify.

Section 2.3, page 4799, line 10: Please explain how XCO2 and XCH4 are computed from VCO2 and VCH4.

Section 4.2, page 4805, line 17: I do not understand what "the target reflectance should be considered as retrieved". Please clarify.

Fig. 1: This figure gives a nice overview about the GOSAT spectral coverage but it does not allow to see very much details. I recommend to add another figure where details of the spectral fits are shown including the fit residuals for the different conditions in the fitting windows used.

Fig. 2: Possible typo "synthsize". Please add to what quantity "root mean squares" refers.

Fig. 3: It would be good if in addition the absolute number of measurements are shown.

Fig. 5: Annotation Uncertainty Reduction. CO2 needs to be replaced by CH4.

Fig. 7: The colors for certain months cannot be distinguished, e.g., July - Sept. I recommend to use a different color for each month.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4791, 2010.