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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 #4

Received and published: 29 December 2010

This paper describes the details of the CO2 and CH4 GOSAT SWIR retrievals produced by the GOSAT team. This documentation is important for users of these products. AMT is an appropriate journal for this article. The paper is clearly written and should be published. The comments below should be addressed before publication.

There should be more detail in the paper, enough such that others can reproduce results or make detailed comparisons. For example, it would be useful to show one or more spectra in standard units of intensity. The details of the locations of such spectra

should be given. In addition, the spectral fits (broken out by the different retrieved parameters), radiance residuals, etc., should also be shown. It would be helpful to see spectral biases in the fits and values of auxiliary parameters retrieved, especially aerosol AOD and surface pressure (for example, do the retrieved values make sense?). It would also be nice to show the Jacobians so that readers get an idea of their spectral dependence.

More discussion of sunglint retrievals over ocean would be helpful.

Realizing that the scope of the paper does not include validation, the CO2 and CH4 results show some interesting features such as the high CO2 and CH4 values near the Amazon region of South America. The CO2 and CH4 are highly correlated. Can the authors make a comment about this. Do you believe these are real features or are they perhaps due to aerosol contamination?

Minor comments

Abstract and elsewhere: "agree well": As noted by the other reviewers, this is subjective and open to alternative interpretations.

p. 4794, L9: Please clarify (also noted by another reviewer), SWIR observations are sensitive to the total column gas abundance.

p. 4794, L15: Please clarify, "spatially and temporally averaged data...", on what spatial and temporal scales?

Sect. 3.1: Have the authors considered using TIR channels to screen cirrus or is the 2 um check sufficient?

Sect. 4.1: Please spell out MAP at its first occurrence (Subsection title).

Sect. 4.2 and elsewhere: It would be helpful to state the spectral ranges in terms of wavelength for those who are more used to those units.

p.4804, L17: Is the atmospheric layering (15 layers) used for the radiative transfer as

well as the retrieval? I am a bit confused about how the radiative transfer table lookup is implemented. For example, how are model temperatures used in the table lookup (is linear interpolation used for both temperature and pressure)? More detail on this would be helpful.

Is there any evidence for a constant temperature bias from the GPV model?

p.4806: Can you give more details about the modeled aerosols. Since the single-scattering albedo (and phase functions) are assumed as fixed, have there been comparisons with other data such as AERONET to verify the accuracy of the model?

p.4815: "...interference error due to auxiliary parameters is relatively small." What about aerosol - it appears to have a significant impact? Have the authors compared retrieved AOD with other measurements, satellite or ground-based?

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