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Atmospheric Measurement Techniques Discussions

Interactive comment on "Information Content Analysis: The Potential for Methane Isotopologue Retrieval from GOSAT-2" *by* Edward Malina et al.

Anonymous Referee #2

Received and published: 10 November 2017

Methane isotopologue detection is important for methane source detection. Measurements of isotopologues from satellite would be very important. The paper by Malina et al. is an interesting and informative paper on methane isotopologue detection capability, and is very relevant for GOSAT-2 and other future SWIR spectrometers. In general the story of the paper is well-written (although the text somewhat sloppy) and the figures are clear. The paper is suited for AMT.

The paper can be accepted after the following comments are addressed.

Main comments:

- Sect. 2.1: A better description of the applicability of the limb sounding forward model ORFM for a nadir viewing instrument like GOSAT-2 is needed. There are missing

processes in the ORFM model, like atmospheric scattering. Is surface reflection well included? Is surface elevation included?

- The term "solar inclination angle" is not used in nadir remote sensing. Therefore, this term should be converted to the term "solar zenith angle", which is 90 degrees – solar inclination angle. Please use the symbol \theta_0 for the solar zenith angle and \theta for the viewing zenith angle.

- P. 8, l. 17: What is the basis of setting the scaling factor f to (10 %)2 variance ? This means that you needed a much larger deviating delta13C than can be anticipated. What is the basis of that assumption?

Minor and Textual comments:

- P. 2, l. 6: acronym GHG was already explained on the previous page

- P. 2, l. 28: please give a reference for VPDB

- P. 3, l. 18: 6ppbv: please add a space between the number and the unit. This holds throughout the paper, at many places, for many quantities, including %.

- Table 1: please give the spectral resolution of the bands.

- Eq. 7: DOFS: acronyms should not be in italics because they are not symbols

- P. 11, l. 4: please give an example of such errors.

- P. 11, l. 18: channel > channels

- P. 11, l. 30-32: this should be mentioned earlier.

- P. 12, l. 17: why a comma after 2\nu3?

- P. 13, l. 8: phenomenon > phenomena

- P. 14, l. 1-2: All simulations ..: please add this information to the main text because it is important information.

- P. 14, l. 10: spectral irradiance > solar irradiance

- At the same line: please remove: “due to blackbody solar emissions” (which is a strange comment)

- P. 14, l. 20-23: too long sentence - please make shorter sentences.

- P. 15, l. 6: At which wavelength do these albedo values hold? Please give a reference for these surface albedo values.

- P. 15, l. 17: please refer to Eq. 11 for the definition of f

- P. 16, l. 9: why does the inclination angle not matter? This is unexpected. The air mass is much larger at smaller inclination angles.

- P. 16, l. 10: The hotspot depends on the scattering angle, not on the inclination angle; the sun glint depends on viewing and solar geometry.

- P. 16, l. 11: extreme angles > special geometries

- P. 16, l. 23: “ . . ., this is an . . .”: please start a new sentence

- P. 17, l. 8: . . .therefore: please start a new sentence

- P. 17, l. 13: remove: including

- P. 17, l. 33: manuscript > paper (also on next page)

- Caption fig. 4: Degrees of Freedom for Signal

- Caption Table 4: Summarisation > Summary; and 6 surface albedos

- Table 4: remove DOFS in the left-hand column since it is superfluous

- P. 19, l. 20: remove the points around below.

- P. 20, l. 5: a priori should be in italics, and not in quotation marks (throughout the paper)

- Caption Fig. 5: remove the second word retrieval

- Caption Fig. A1: f should not be in quotation marks, since it is a normal symbol

Figures:

Fig. 1: please give the unit of the x-axis

References:

The references are very sloppy. First of all, the authors should replace the URLs by normal journal references. Please replace capital font for titles by normal font. Aydin et al.: the journal name is missing.

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