

The manuscript entitled “Retrieval algorithm for CO₂ and CH₄ column abundances from short-wavelength infrared spectral observations by the Greenhouse Gases Observing Satellite” by Yoshida et al. described the recent version (V01) of GOSAT retrieval algorithm for space-borne measurement of greenhouse gases CO₂ and CH₄. GOSAT was the first satellite designed and successfully launched to measure the two major greenhouse gases from space. The manuscript covers an important and hot topic. It will benefit the carbon cycle study community and will be highly cited. The manuscript is clearly outlined and the retrieval algorithm is well described. I recommend it to be published in AMT after the following comments are addressed.

Section 2.1 in the 2nd paragraph about cloud and aerosol effects, an earlier paper by Mao and Kawa (2004 in Applied Optics) may be cited as the first publication showing full radiative transfer calculation results for aerosol and cirrus cloud scattering effects on CO₂ measurement path length using the surface reflected SWIR.

Section 4.1, a reference may be cited for the Levenberg-Marquardt method. And what are the typical value of λ and number of iterations needed for most retrievals?

Section 4.2, the relationship between the “surface albedo” and the “target reflectance” in the retrieval should be clarified. It seems the Lambertian surface is assumed here.

P. 4804, line 20, what the weighting function h is? Please provide its formula or definition.

Section 5, line 20, the AOD threshold value of 0.5 is for every band or just for CO₂/CH₄ band at 1.6 μm ? since AOD of aerosols is a function of wavelength.

P. 4806, line 1, it seems that TANSO-FTS band 3 at 2 μm is used in this paper to screen cirrus clouds in the retrievals.

Section 6.2 about information from measurement, the GOSAST measurement capability for both CO₂ and CH₄ changes may be described and illustrated in this section. It could be the simulated sensitivity to both CO₂ and CH₄ variability for single measurement.

Section 6.3, 1st paragraph about Xco₂ and Xch₄ retrievals results, are these general seasonal variations from a priori or from radiance responses? This question is relevant to the previous question and should be addressed somehow and somewhere in this paper.

Section 6.3 about the retrieval results needs to be extended to include how the retrieval errors are estimated and both retrieval precision and accuracy as two components of data uncertainty need to be presented and discussed, even though the reasons for the large bias in current GOSAT retrievals are still inconclusive. As addressed in the first paragraph of introduction, CO₂ measurement is about carbon flux and bias in the measurement is even more critical than radon errors in estimating carbon flux.