Dear, Anonymous referee #2,

The authors would like to appreciate your careful reviews and detailed comments to our manuscript. We response to your comments and show corrected parts of the manuscript as listed below. Referee's comments were shown with *Italic* and the sentences with red color are added in the manuscript.

1.

The authors used a lot of acronyms in this manuscript. Although using acronyms helps simply the long terms, too many of them also confuse people (and the authors themselves). I recommend the authors remove those acronyms that were used for only once, such as CLOUDIA (Page 3, line 10); LST (Page 14, line 7). Some acronyms are not defined before use, such as NIES (Page 5, line 21). As a result, it is highly recommended that the authors do a thorough check.

We accepted your suggestion that the acronyms of CLOUDIA and LST should be removed. Although the acronyms such as VAS, MODIS, S-HIS, ASTER, IGBP, AER, HITRAN, and AIRS were used only once in the body of the manuscript, they had not removed because they are widely known in this study field. "NIES" was corrected as to "the National Institute of Environmental Studies (NIES)".

2.

I highly suggest the authors add a flow chart to help readers understand the procedures and steps of the retrieval process. Although the authors have described how the channels are reconstructed and optimized and how the method is applied to GOSAT, it is deemed necessary that a flow chart be added for better illustration.

We had added the flowchart of the simulation and retrieval processes as shown below;

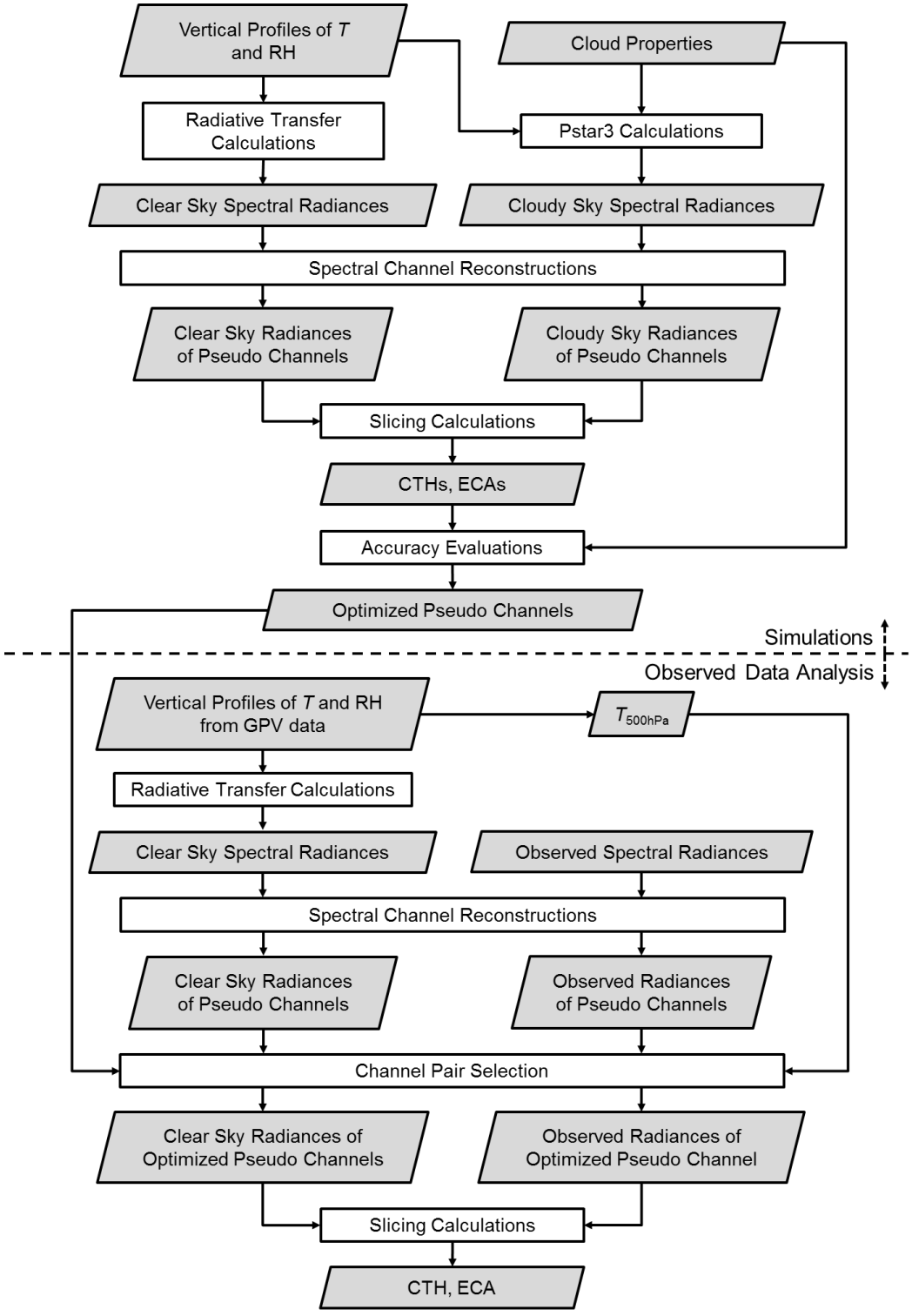

Figure 1. Flow chart showing simulation-based channel optimizations and observed data analysis. White boxes are processes. The gray parallelograms are variables.

3.

Page 12, line 24: "All the data for GOSAT and CALIPSO observed in January and July were analyzed." – The question is what is the temporal range of the data used? 2007 to present time? How many collocated observations are found? Please specify!

The data used in this study were observed in 2010. The expression "in January and July" at Page 12, line 24 was corrected as to "in January and July in 2010". The number of collocated data was 123 for GOSAT and 316 for CALIPSO. Actually, this number is already specified on Page 17, line 4.

4.

About the differences in the retrieved cloud top height and cloud amount between this study and CALIPSO, how much of the bias is related to the differences in cloud optical properties used in the radiative transfer model? Also, the authors should specify what are the cloud optical properties they used in the radiative transfer calculation for retrieval purposes.

The CO_2 slicing method doesn't assume cloud properties in the radiative transfer calculations of the retrieval processes. They are assumed only in the simulations for the channel selection. However, the slicing method has to assume that the cloud emissivity is constant for all channels and clouds are infinitesimally thin. These assumptions can generate the CTH biases compared with CALIPSO observations. As mentioned at the end of Section 3.1 (Page.8, line 19~), Menzel et al. (1992) had reported that the errors associated with the assumption about the emissivity is negligible, but that about the cloud thickness can cause some biases especially for optically thin clouds. The previous studies (e.g., Hawkinson et al., 2005) reported the systematic biases of CTHs from the slicing method compared with the active sensor observations. Holz et al. (2006) reported that the slicing method detects the height where the integrated cloud optical thickness from the cloud top observed by the lidar is approximately 1.0. However, in the right panel of Fig. 11, the most clouds whose optical thickness less than 1.0 are precisely detected and the apparent negative biases of CTHs are not shown in this figure. Therefore, the biases related to the assumption about the cloud thickness could be not so large in the improved slicing method. The sentences were added into the text as below.

P. 17, line 20: ～detectable CTH. Holz et al. (2006) also reported that the slicing method detects the height at which the integrated cloud optical thickness from the cloud top observed by the lidar is approximately 1.0. However, most clouds for which the optical thickness from CALIPSO is less than 1.0 are detected precisely using the slicing method, as shown in this figure. This result demonstrates that the error associated with the assumption about the infinitesimally thin cloud is reduced by the reconstruction and optimization of spectral channels. In some cases～

The information about cloud particles assumed in the simulation studies was added in the sect. 3.3 as below.

P.10, line 14: ～and 6-15km. Water particles with modal radius of 8.0 μm were assumed for low clouds. Ice particles with modal radius of 20.0 μm were assumed for middle and high clouds. The cloud optical ～

5.

Page 2, line 23: "increasing 2.07 ppm" should be "increasing at 2.07 ppm"
Page 3, line 14: "it enables to " should be "it is able to"
Page 4, line 9: "calling" should be "called"
Page 5, line 24-25: ". . . until July . . . from August" should be ". . . from January to July . . . from August to December"
Page 6, line 28: "referred" should be "inferred"
Page 12, line 8: "the seen" should be "the scene"
Page 12, line 12: "compare the results" should be "compare with the results"
Page 13, line 23: "determine" should be "distinguish"
Page 14, line 12: remove "then"
Page 16, line 7: "generally agreement" should be "general agreement"
Page 17, line 24: "occur" should be "incur"
Page 18, line 10: "simultaneous studies" should be "simultaneous results"

All of the minor comments above were accepted to the manuscript.

Sincerely,

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