

Evaluation of GOSAT/TANSO-FTS TIR CH<sub>4</sub> data using NICAM-TM and aircraft CH<sub>4</sub> data

\*Ryosuke Nonogaki<sup>2,1</sup>, Naoko Saitoh<sup>2</sup>, Ryoichi Imasu<sup>3</sup>, Kei Shiomi<sup>4</sup>, Yosuke Niwa<sup>5</sup>, Shuji Aoki<sup>6</sup>, Shinji Morimoto<sup>7</sup>, Toshinobu Machida<sup>8</sup>, Hidekazu Matsueda<sup>5</sup>, Yousuke Sawa<sup>5</sup>, Kazuhiro Tsuboi<sup>5</sup>

1.The Graduate School of Advanced Integration Science, Chiba university, 2.Center for Environmental Remote Sensing, 3.Atmosphere and Ocean Research Institute, The University of Tokyo, 4.JAXA, 5.Meteorological Research Institute, 6.Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University, 7.Graduate School of Science, Tohoku University, 8.National Institute for Environmental Studies

Greenhouse gases Observing SATellite (GOSAT) is the first satellite that was dedicated to the global observations of CO<sub>2</sub> and CH<sub>4</sub>, and was launched on January 23, 2009. CH<sub>4</sub> profiles can be retrieved from the thermal infrared (TIR) band of Thermal and Near-infrared Sensor for Carbon Observation Fourier Transform Spectrometer (TANSO-FTS) on board the GOSAT. In this study, we compared CH<sub>4</sub> data from the TIR band of TANSO-FTS with CH<sub>4</sub> data from Nonhydrostatic Icosahedral Atmospheric Model-based Transport Model (NICAM-TM) [Niwa et al., 2011] and aircraft measurements to evaluate the quality of the TIR CH<sub>4</sub> data. First, we compared TIR, NICAM-TM, and CONTRAIL/GRENE CH<sub>4</sub> data [Sawa et al., 2015] on the isentropic surfaces in the upper troposphere and lower stratosphere. Second, we compared TIR CH<sub>4</sub> data with JMA aircraft CH<sub>4</sub> measurement data over Minamitorishima [Niwa et al., 2014] in the upper and middle troposphere. Here, we adopted a distance between TANSO-FTS and the aircraft measurement locations within ±3 degree and a time difference between the two observations within ±3 days as criteria for the comparisons. From the isentropic analysis, we found that the CONTRAIL/GRENE CH<sub>4</sub> concentrations showed a large seasonal variation in the lower stratosphere, while the TIR CH<sub>4</sub> data had higher concentrations there than the CONTRAIL/GRENE data and showed a relatively small seasonal variation; the seasonal variation of the NICAM-TM CH<sub>4</sub> data were smaller than that of the TIR data. From the profile comparisons over Minamitorishima, we found that the TIR and aircraft CH<sub>4</sub> data agreed to each other within 30 ppb at around 6 km in winter and spring, while their differences increased to 30 -50 ppb in summer. We also investigated the impact of the coincident criteria on the comparisons results. Besides, we analyzed latitudinal distribution of TIR and aircraft CH<sub>4</sub> data in the upper troposphere between Atsugi and Minamitorishima.

#### Acknowledgements

CONTRAIL/GRENE flask sampling data over Siberia was conducted under the GRENE Arctic Climate Change Research Project. Aircraft measurements between Atsugi and Minamitorishima were conducted by the Japan Meteorological Agency.

Keywords: GOSAT, CH<sub>4</sub>, evaluation