



## Atmospheric carbon dioxide and methane measured by GOSAT and GOSAT-2

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The Greenhouse gases Observing SATellite (GOSAT) was launched on January 23, 2009, into a sun-synchronous orbit at an altitude of 666 km with 3-day revisit cycle, and has been operating for about ten years. GOSAT is equipped with two instruments: the Thermal And Near-infrared Sensor for carbon Observation Fourier Transform Spectrometer (TANSO-FTS) and the Cloud and Aerosol Imager (TANSO-CAI). TANSO-FTS has three narrow bands in the short-wavelength infrared (SWIR) region (0.75-0.78, 1.56-1.72, and 1.92-2.08  $\mu\text{m}$ ) and a wide thermal infrared (TIR) band (5.5-14.3  $\mu\text{m}$ ) at a spectral sampling interval of about 0.2  $\text{cm}^{-1}$ . The TANSO-FTS instantaneous field of view (IFOV) is 15.8 mrad, corresponding to a nadir footprint diameter of 10.5 km. TANSO-CAI has four narrow bands in the near-ultraviolet to near-infrared region at 0.38, 0.674, 0.87, and 1.6  $\mu\text{m}$  with a higher spatial resolution than TANSO-FTS. TANSO-CAI can detect optically thick clouds within the TANSO-FTS IFOV. The column-averaged dry air mole fractions of carbon dioxide, methane, and water vapor ( $\text{XCO}_2$ ,  $\text{XCH}_4$ , and  $\text{XH}_2\text{O}$ ; hereafter called Xgas) have been retrieved globally from cloud-free SWIR spectral data of TANSO-FTS. Xgas are simultaneously retrieved using a so-called full-physics retrieval method, and its accuracy and precision are evaluated by comparing with the Total Carbon Column Observing Network (TCCON) data. TCCON data is also utilized for an empirical bias correction of Xgas. Both bias-corrected and bias-uncorrected Xgas are released as the FTS SWIR L2 product and available via GOSAT Data Archive Service (GDAS; <https://data2.gosat.nies.go.jp/>).

As a successor mission to the GOSAT, GOSAT-2 was launched on October 29, 2018, into a sun-synchronous orbit at an altitude of 613 km with 6-day revisit cycle. GOSAT-2 is also equipped with two instruments: TANSO-FTS-2 and TANSO-CAI-2. TANSO-FTS-2 has three SWIR bands (0.75-0.77, 1.56-1.69, and 1.92-2.33  $\mu\text{m}$ ) and two TIR bands (5.5-8.4 and 8.4-14.3  $\mu\text{m}$ ) at a spectral sampling interval of about 0.2  $\text{cm}^{-1}$ . The TANSO-FTS-2 IFOV is also 15.8 mrad, corresponding to a nadir footprint diameter of 9.7 km. TANSO-CAI-2 has five forward-looking (+20°) bands at 0.343, 0.443, 0.674, 0.869, and 1.63  $\mu\text{m}$  and five backward-looking (-20°) bands at 0.380, 0.550, 0.674, 0.869, and 1.63  $\mu\text{m}$ . TANSO-CAI-2 provides cloud information from forward-looking bands and backward-looking bands, independently. The SWIR L2 retrieval algorithm for GOSAT-2 is developing based on the latest retrieval algorithm for GOSAT. Since the spectral range of TANSO-FTS-2 is expanded to cover the 2.3  $\mu\text{m}$  carbon monoxide (CO) absorption band, XCO is also retrieved simultaneously with other gases in the full-physics retrieval method. In addition to the full-physics based  $\text{XCO}_2$ ,  $\text{XCH}_4$ ,  $\text{XH}_2\text{O}$ , and XCO products, we are planning to provide the proxy-based  $\text{XCH}_4$  product as well as solar induced chlorophyll fluorescence (SIF) product. GOSAT-2 will start its operational observation from February 2019. We will present the preliminary retrieval results from SWIR data of GOSAT-2 TANSO-FTS-2 in the session.