

Comparisons of column-averaged dry-air mole fractions of greenhouse gases among GOSAT/TANSO-FTS SWIR, TIR, and NICAM-TM data

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Greenhouse gases Observing SATellite (GOSAT) was launched on 23 January, 2009. Thermal and Near-infrared Sensor for Carbon Observation Fourier Transform Spectrometer (TANSO-FTS) on board the GOSAT has SWIR and TIR bands and can observe column-averaged dry-air mole fractions of CO₂ and CH₄ (XCO₂ and XCH₄) in the SWIR bands [Yoshida et al., 2011] and CO₂ and CH₄ vertical profiles in the TIR band [Saitoh et al., 2009]. In this study, we calculated XCO₂ and XCH₄ values from the TIR CO₂ and CH₄ profiles, and then compared them with XCO₂ and XCH₄ data of the SWIR bands and Nonhydrostatic ICosahedral Atmospheric Model-based Transport Model (NICAM-TM) [Niwa et al., 2011]. Before calculating the TIR XCO₂ values, we applied bias-correction values evaluated based on the comparisons of aircraft CO₂ data.

We compared latitudinal distributions of XCO₂ among TANSO-FTS TIR, SWIR, NICAM-TM, and a priori (NIES-TM05) data [Saeki et al., 2013]. TIR XCO₂ data over the land in the Northern Hemisphere except the Sahara desert were slightly smaller than SWIR XCO₂ data and, in contrast, slightly larger over the land in the Southern Hemisphere. Over the Sahara desert, TIR XCO₂ data in the daytime were considerably smaller than SWIR and NICAM-TM XCO₂ data, which suggests that surface parameters used in the TIR retrieval had some problems. Over Hawaii where there is no strong CO₂ source, TIR XCO₂ data agreed with SWIR XCO₂ data to within 1% on average.

Keywords: GOSAT, XCO₂, XCH₄