

3.046 Comparisons of XCO₂ data from SWIR and TIR bands of GOSAT/TANSO–FTS.

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Abstract:

This study has assessed the quality of CO₂ data retrieved from the thermal infrared (TIR) band [Saitoh et al., 2016] of Thermal and Near-infrared Sensor for Carbon Observation–Fourier Transform Spectrometer on board Greenhouse Gases Observing Satellite (GOSAT) by comparing the column-averaged dry-air mole fractions (XCO₂) calculated based on the TIR CO₂ data with aircraft XCO₂ data, XCO₂ data from Nonhydrostatic Icosahedral Atmospheric Model–based Transport Model (NICAM–TM) [Niwa et al., 2011, 2012, 2017], and XCO₂ data retrieved from the short-wave infrared (SWIR) band [Yoshida et al., 2011, 2013] of TANSO–FTS. Overall, TIR XCO₂ data agreed with SWIR XCO₂ data to within 1% on average over the ocean and the land except the Sahara in the Northern Hemisphere after applying TIR CO₂ bias-correction values proposed by Saitoh et al. [2017]. In the Southern Hemisphere, TIR XCO₂ data were slightly larger than SWIR and NICAM–TM XCO₂ data, which suggests overcorrection of the negative biases in TIR CO₂ data. In background regions without any strong CO₂ sources like Hawaii, bias-corrected TIR XCO₂ data agreed with SWIR XCO₂ data to within 0.2% on average and showed much better agreement with NICAM–TM XCO₂ data, which demonstrates a certain degree of consistency between CO₂ measurements by the two bands. We have evaluated the consistency between the two bands through comparisons of bias-corrected TIR and SWIR XCO₂ data with XCO₂ data obtained in the Comprehensive Observation Network for TRace gases by AirLiner (CONTRAIL) project [Machida et al., 2008] by applying TIR and SWIR CO₂ averaging kernel functions to the aircraft CO₂ data over airports. The results showed that there were some disagreements among the three XCO₂ data in some seasons and regions, which suggests the seasonal and regional dependence of quality of CO₂ data from the two bands of TANSO–FTS.