

Validation of GOSAT/TANSO-FTS TIR CO₂ profiles using aircraft CO₂ data

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Greenhouse gases Observing SATellite (GOSAT) was launched on 23 January 2009 to observe major greenhouse gases such as CO₂ and CH₄. Thermal and Near-infrared Sensor for Carbon Observation Fourier Transform Spectrometer (TANSO-FTS) on board the GOSAT can observe CO₂ profiles in the thermal infrared (TIR) region, but the quality of the retrieved CO₂ profile data has not yet been fully validated. In this study, we compared GOSAT/TANSO-FTS TIR CO₂ profiles with aircraft CO₂ data to evaluate their quality. The aircraft data we used were obtained by Comprehensive Observation Network for Trace gases by Air-line (CONTRAIL) project and Civil Aircraft for the Regular investigation of the atmosphere Based on an Instrument Container (CARIBIC) project, both of which are commercial airliner projects.

First, we assumed CONTRAIL data obtained during ascending and descending flights over airports as a "CO₂ profile", and then compared TIR CO₂ profiles with the CONTRAIL CO₂ profiles to which the TIR averaging kernel functions were applied. We adopted a distance between the GOSAT observation and the airport within 300 km and a time difference between the two observations within 72 hour as criteria for the comparison. Here, we used the CONTRAIL profile data obtained over the ten airports: Moscow, Amsterdam, Vancouver, Narita, Delhi, Honolulu, Bangkok, Singapore, and Djakarta. We also used CONTRAIL and CARIBIC level flight data to validate the global distributions of TIR upper tropospheric CO₂ data. We divided the level flight aircraft data into several regions, and then compared the averaged aircraft data with the averaged TIR data in each region.

From the CO₂ profile comparisons at each airport, we found the TIR data had a low bias of 1-1.5%. The magnitude of the bias varied depending on seasons and latitudes; in spring and summer in low latitude, the magnitude of the bias was larger than that in autumn and winter in mid and high latitudes. From the upper tropospheric CO₂ comparisons, the TIR data showed better agreements to the aircraft data than the a priori data, and the distribution of the TIR upper tropospheric CO₂ data had a similar pattern to the distribution of the aircraft data. In the poster, we will also report the details of the comparisons using other aircraft data.

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