

Progress on validation of GOSAT and GOSAT-2 FTS SWIR L2 Products

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The Greenhouse gases Observing SATellite (GOSAT), launched on 23 Jan. 2009, is the world's first satellite dedicated to measuring the concentrations of the two major anthropogenic greenhouse gases, carbon dioxide (CO₂) and methane (CH₄), from space. Column-averaged dry air mole fractions of CO₂ and CH₄, and water vapor (H₂O) (denoted as XCO₂, XCH₄ and XH₂O) are retrieved from the Short-Wavelength InfraRed (SWIR) spectral data observed with the Thermal And Near-infrared Sensor for carbon Observation - Fourier Transform Spectrometer (TANSO-FTS) onboard GOSAT. The present NIES full physics SWIR retrieval algorithm (Ver. 02.81) for land high-gain soundings showed small biases and standard deviations, by comparing with data of the Total Carbon Column Observing Network (TCCON): -0.33 ppm and 2.17 ppm for XCO₂, -1.9 ppb and 13.4 ppb for XCH₄, and -0.80% and 33.4% for XH₂O, respectively. Retrievals from the GOSAT TANSO-FTS SWIR spectra for more than ten years are already being used for scientific research applications.

A successor of GOSAT, GOSAT-2 was launched on 29 Oct. 2018, and is now in operational. In addition to XCO₂, XCH₄, and XH₂O, XCO (column-averaged dry air mole fraction of carbon monoxide) is retrieved from GOSAT-2 TANSO-FTS-2 SWIR spectra. The main approach of acquiring validation data for GOSAT-2 is the same as those for GOSAT. Ground-based FTSs data from TCCON and NDACC IRWG (Network for the Detection of Atmospheric Composition Change-InfraRed Working Group) sites will be used, and some sites will be co-located with lidar and sky-radiometer systems for extensive validation data acquisition. In-situ measurements and/or sampling of CO₂, CH₄, and CO onboard commercial and charter aircraft by CONTRAIL (Comprehensive Observation Network for TRace gases by AirLiner) and NOAA (National Oceanic and Atmospheric Administration) will also be employed.

In this presentation, we focus on the current status of the GOSAT product validation and preliminary evaluation of the GOSAT-2 products using the TCCON data, as well as related validation activities.

Keywords: Greenhouse Gas , Satellite Observation, Greenhouse gases Observing SATellite (GOSAT), GOSAT-2, Validation, Total Carbon Column Observing Network