



Sensitivity Analysis for CO₂ Retrieval using GOSAT-2 FTS-2 Simulator

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The Greenhouse Gases Observing Satellite (GOSAT), launched in 2009, is the world's first satellite dedicated to global greenhouse gases observation. GOSAT-2, the successor mission to GOSAT, is scheduled for launch in early 2018. The Fourier Transform Spectrometer-2 (FTS-2) is the primary sensor onboard GOSAT-2. It observes infrared light reflected and emitted from the Earth's surface and atmosphere. The FTS-2 obtains high resolution spectra using three bands in the near to short-wavelength infrared (SWIR) region and two bands in the thermal infrared (TIR) region. Column amounts and vertical profiles of carbon dioxide (CO₂) and methane (CH₄) are retrieved from the radiance spectra obtained with the SWIR and TIR bands, respectively. Further, compared to the FTS onboard the GOSAT, the FTS-2 has several improvements: 1) added spectral coverage in the SWIR region for carbon monoxide (CO) retrieval, 2) increased signal-to-noise ratio (SNR) for all bands, 3) extended range of along-track pointing angles for sunglint observations, 4) intelligent pointing to avoid cloud contamination.

Since 2012, we have been developing a simulator software to simulate the spectral radiance data that will be acquired by the GOSAT-2 FTS-2. The purpose of the GOSAT-2 FTS-2 simulator is to analyze/optimize data with respect to the sensor specification, the parameters for Level 1 processing, and the improvement of the Level 2 algorithms. The GOSAT-2 FTS-2 simulator includes the six components: 1) overall control, 2) sensor carrying platform, 3) spectral radiance calculation, 4) Fourier Transform module, 5) Level 1B (L1B) processing, and 6) L1B data output. It has been installed on the GOSAT Research Computation Facility (GOSAT RCF), which is a high-performance and energy-efficient supercomputer. More realistic and faster simulations have been made possible by the improvement of the details of sensor characteristics, the sophistication of the data processing and algorithms, the addition of the various observing modes including calibration observation, the use of surface and atmospheric ancillary data for radiative transfer calculation, and the speed-up and parallelization of the radiative transfer code.

We will summarize the current status and the future plans in the development of the GOSAT-2 FTS-2 simulator. We will also demonstrate the reproduction of GOSAT FTS L1B data and present the sensitivity analysis relating to the engineering parameters, the aerosols and clouds, and so on, on the Level 1 processing for CO₂ retrieval using latest version of the GOSAT-2 FTS-2 simulator.