



Retrieval of XCO₂ and XCH₄ from GOSAT and comparison with TCCON measurements.

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The JAXA Greenhouse gas Observing Satellite (GOSAT), launched in 2009, is the first operating mission dedicated to measuring greenhouse gas concentrations from space. Onboard GOSAT, the TANSO-FTS instrument acquires near-infrared spectra of sunlight backscattered by the Earth's surface and atmosphere, exhibiting absorption features of CO₂ and CH₄ highly sensitive to their concentration in the lower atmosphere. We retrieve CH₄ and CO₂ column-averaged dry air mole fractions (XCO₂ and XCH₄) from TANSO-FTS spectra using a full-physics algorithm developed by Butz et al., 2009. In this model, atmospheric scatterers (aerosols or thin cirrus particles) are parameterized using three effective parameters representing the amount, size, and height distribution of the scatterers. These three parameters are retrieved simultaneously along with XCO₂ and XCH₄. This method has been proven to reduce the uncertainty caused by the modification of lightpath by scatterers (Butz et al., 2010).

We applied our Full Physics algorithm to TANSO-FTS measurements collocated with nine Total Carbon Column Observing Network (TCCON) stations for the period between April 2009 and July 2010. Cloudy scenes are removed beforehand using level 2 data products from the Cloud and Aerosol Instrument (CAI) onboard GOSAT. The retrieved XCO₂ and XCH₄ from GOSAT agree well with the corresponding TCCON values. Here, the 1- σ scattering of GOSAT measurements is about 0.8% for CO₂ and 1% for CH₄. A more relevant piece of information for validation purpose is to look at the regional bias between GOSAT and TCCON measured from station to station. To this day, the regional bias remains rather unsatisfactory for XCO₂ (~2.5 ppm) but is very promising in the case of CH₄ (less than 10 ppb). This validation exercise thus confirms that XCH₄ measurements from GOSAT provide a promising source of information for the inverse modeling of sources and sinks on regional scales.

In this presentation we put particular emphasis on the use of TANSO-FTS measurements in the range 5150 – 5190 cm⁻¹, with strong water absorption. These measurements provide important information about scatterers high in the troposphere. Finally, we discuss the capability of GOSAT to provide XCO₂ and XCH₄ retrievals over the ocean from glint observations.