



## **Southern Hemisphere validation of GOSAT XCO<sub>2</sub> and XCH<sub>4</sub> from TCCON solar FTS measurements in Australia and New Zealand**

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GOSAT carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) retrieval errors need to be well characterized if these data are to be used to constrain inverse model surface flux estimates. Data from the Total Carbon Column Observing Network (TCCON) are the primary validation data for GOSAT Short-Wavelength InfraRed (SWIR) retrievals. We describe the status of an ongoing critical appraisal of measurements from the three Southern Hemisphere (SH) TCCON sites, Darwin and Wollongong (Australia) and Lauder (New Zealand), in order to generate a high quality, self consistent data set for GOSAT validation. Screened and calibrated SH TCCON data are then compared with NIES GOSAT v01.xx SWIR nadir-view retrievals of the total column and dry air mole fraction (X<sub>Y</sub>) of CO<sub>2</sub> and CH<sub>4</sub> in a 2×2 degree area centred on each TCCON site. Preliminary results, albeit for limited sample sizes, show biases ~2–3% for XCO<sub>2</sub> and ~0.7% for XCH<sub>4</sub> and random errors of ~1–2% (one sigma) for the GOSAT retrievals compared to TCCON data from Darwin and Lauder. However, comparisons at Wollongong, where the number of collocations (25) is largest, show larger biases (~7% for XCO<sub>2</sub> and ~5% for XCH<sub>4</sub>) and higher scatter (2%). Further analysis of collocated data in the vicinity of the Wollongong site shows variations in GOSAT dry air total column retrievals account for 30–45% of the variance in GOSAT X<sub>Y</sub> retrievals. The reasons for the GOSAT retrieval error characteristics in the vicinity of Wollongong are explored in detail.