

Remote sensing and in situ measurements of greenhouse gases at the Sodankylä TCCON site

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Remote sensing measurements of key greenhouse gases have been conducted at Sodankylä already since 2009. The site participates in the Total Carbon Column Observing Network (TCCON). The instrumentation is designed to record high-resolution solar spectra in the near-infrared spectral region. From the spectra we derive column-averaged abundances of CO₂, CH₄, N₂O, HF, CO, H₂O, HDO and other gases. Our measurements have been used to study variability and trends of greenhouse gases and to provide accurate and precise measurements suitable for the development of models and satellite based retrievals. The relevant satellite missions include the Orbiting Carbon Observatory-2 (OCO-2); the Greenhouse Gases Observing Satellite (GOSAT); the SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY), the TROPOspheric Monitoring Instrument (TROPOMI) on board of the Copernicus Sentinel-5 Precursor satellite and TanSat. Here we report updated trend estimates of CO₂ and CH₄ based on the TCCON measurements as well as comparisons with the satellite borne measurements. Finally we present in situ AirCore observations in the vicinity of the TCCON instrument at Sodankylä. AirCore measurements are used in this study to provide comparisons with remote sensing retrievals. New AirCore instruments are currently under development, including novel UAV-based solutions.

Reference

Kivi, R. and Heikkinen, P.: Fourier transform spectrometer measurements of column CO₂ at Sodankylä, Finland, *Geosci. Instrum. Method. Data Syst.*, 5, 271-279, doi:10.5194/gi-5-271-2016, 2016.