

Remote sensing measurements of greenhouse gases at Sodankylä

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A Fourier Transform Spectrometer (FTS) was installed at Sodankylä in early 2009 to study changes in high latitude greenhouse gas concentrations. The FTS spectrometer is recording direct solar spectra in the near-infrared spectral region in the spectral range between 0.7 and 2.5 μm . Column-averaged abundance of CO_2 , CH_4 , N_2O , HF, CO, H_2O , and HDO are retrieved from the spectra. The FTS instrument belongs to the Total Carbon Column Observing Network (TCCON) and it has been optimized for greenhouse gas measurements.

Our data has been used for satellite validation purposes among other research applications. We have contributed to the validation of the GOSAT (Greenhouse gases Observing SATellite) by JAXA (the Japan Aerospace Exploration Agency). An ongoing mission is also OCO-2 (Orbiting Carbon Observatory-2) launched in July 2014 by NASA. A future mission relevant to our measurements is S5P Sentinel-5 Precursor, which is an ESA satellite and scheduled for launch in 2016.

At Sodankylä we have also started AirCore profile measurements. AirCore is a sampling system, which is directly related to the World Meteorological Organization in situ trace gas measurement scales. The accuracy of AirCore measurement is 0.05% for CO_2 and CH_4 ; 5% for CO. AirCore method allows sampling in both stratosphere and troposphere, which is a benefit, compared to the aircraft in situ measurements. The sampling system has the potential to provide a ground-truth standard for comparison with total column measurements on board satellites and from ground-based FTS.