



Remote sensing measurements of Carbon Dioxide and Methane at Sodankylä

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Over the recent years, remote sensing technologies for measuring CO_2 and CH_4 from space, from the ground and from aircraft have made great advances. Here we focus on the recent ground based remote sensing measurements using a Fourier Transform Spectrometer (FTS) at Sodankylä, Finland (67.4° N , 26.6° E). Our FTS participates in the Total Carbon Column Observing Network (TCCON). From the measured solar spectra we retrieve column-averaged abundances of atmospheric constituents, including CO_2 , CH_4 , N_2O , HF, CO, H_2O , and HDO. According to our observations column CO_2 values from 2009 to 2017 have increased by 2.3 ± 0.2 ppm per year. During the same time period the measured CH_4 values have increased by 7 ± 0.5 ppb yr^{-1} . The relevant satellite missions include the Orbiting Carbon Observatory-2; the Greenhouse Gases Observing Satellite (GOSAT) and the TROPOMI mission on board ESA's Sentinel-5P satellite. Multiyear comparisons with the GOSAT observations show good agreement: the relative difference in XCH_4 has been $-0.07 \pm 0.02 \%$ and the relative difference in XCO_2 has been $0.04 \pm 0.02 \%$. At Sodankylä we have performed regular AirCore measurements of CO_2 and CH_4 since September 2013. In this study we perform column comparisons using both measurement systems (FTS and AirCore) at the same TCCON site.