

## Measurement of greenhouse gases from novel ground-based remote sensing instruments; the FRM4GHG campaign at the Sodankylä TCCON site, N. Finland.

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Ground-based infrared remote sensing greenhouse gas (GHG) observations are extensively used for the validation of GHG measurements from satellites such as SCIAMACHY, GOSAT and OCO-2, as well as for model studies. The current standard network providing reference ground-based total column GHG data for satellite and model validation is the Total Carbon Column Observing Network (TCCON). TCCON is a network of about 23 stations distributed globally and measuring precise and accurate total column abundances of GHGs (scaled to WMO standards) using a Fourier-transform infrared solar absorption spectrometer (Bruker IFS 125HR). TCCON has some deficiencies in terms of the gaps in coverage, especially in remote locations and locations with high or low albedo. Setting up a TCCON station is expensive, requires special operational conditions with trained personnel for operation and maintenance, and it is not easy to move the station to a new location. This makes it very costly if further expansion of the network is desired.

Several new portable, low cost, easy to operate and maintain spectrometers have recently been developed that have the potential to ameliorate those deficiencies and complement the TCCON network. However, the performances of these instruments have not been fully characterized. The ongoing ESA funded campaign “Fiducial Reference Measurements for Ground-Based Infrared Greenhouse Gas Observations (FRM4GHG)” at the Sodankylä TCCON site in northern Finland aims at characterizing several of these low cost portable spectrometers performing TCCON type measurements simultaneously under different atmospheric conditions in comparison with a co-located TCCON instrument. Regular AirCore launches will also be performed from the site and will provide in-situ reference profiles of the target gases, which will be useful to verify the instruments’ calibrations and biases.

The campaign organized between March – October 2017 will provide a dataset of CO<sub>2</sub>, CH<sub>4</sub> and CO measurements which can be used for validation purpose during the Sentinel 5 – precursor (S5P) commissioning phase, as well as by other satellites and model validation teams. Furthermore, it will provide a comparative characterization of the participating instruments with respect to the standard TCCON in terms of the precision, accuracy, stability, portability and ease of deployment, cost factor, etc. The outcome of the campaign will then be a guideline for the further development of new observation sites to complement the TCCON network and better support for the validation of existing and future satellite missions and models. This poster will focus on the objectives of the campaign and the first results of the measurements performed since the start of the campaign in March 2017.