

# Validation of Total Carbon Column Observing Network (TCCON) Observations of CO<sub>2</sub>/CH<sub>4</sub>/CO at Sodankylä Using AirCore

H. Chen<sup>1</sup>, B. Kers<sup>1</sup>, R. Kivi<sup>2</sup>, P. Heikkinen<sup>2</sup>, J. Hatakka<sup>3</sup>, T. Laurila<sup>3</sup>, S. Houweling<sup>4</sup>, C. Sweeney<sup>5</sup> and P. Tans<sup>6</sup>

<sup>1</sup>Centre for Isotope Research, University of Groningen, Groningen, Netherlands; 31503638638, E-mail: Huilin.Chen@rug.nl

<sup>2</sup>Finnish Meteorological Institute, Arctic Research Centre, Sodankylä, Finland

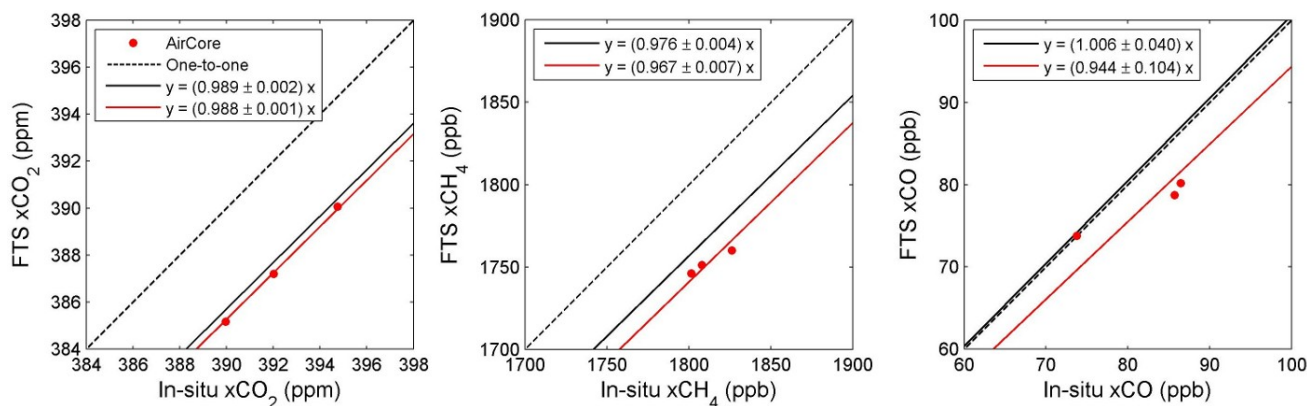
<sup>3</sup>Finnish Meteorological Institute, Helsinki, Finland

<sup>4</sup>Space Research Organization Netherlands (SRON), Netherlands Institute for Space Research, Utrecht, The Netherlands

<sup>5</sup>Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309

<sup>6</sup>NOAA Earth System Research Laboratory, Boulder, CO 80305

As an essential network to validate satellite observations, TCCON observations of CO<sub>2</sub>/CH<sub>4</sub>/CO need to be tightly linked to ground-based observations, (i.e. on the World Meteorological Organization reference scale). AirCore, a long tube descending from a high altitude with one end open and the other closed, has been demonstrated to be a reliable, cost-effective sampling system for high-altitude profile measurements of CO<sub>2</sub> and CH<sub>4</sub>, and an ideal tool to validate TCCON observations. We will present newly available AirCore profiles of CO<sub>2</sub>/CH<sub>4</sub>/CO over Sodankylä since September 2013 near the TCCON site at Sodankylä (67.368N, 26.633E, 179 m.a.s.l), and compare the integrated AirCore column averages with TCCON retrievals (preliminary results shown in Fig.1). Different from previous studies, this effort is to validate total column measurements at relatively high latitude. These activities are becoming important as active satellite sensors, which are currently under development and planned for launch in the near future (e.g. Merlin and ASCENDS), and will allow year around measurements at high latitudes. Furthermore, we compare the AirCore profiles of CH<sub>4</sub> at two TCCON stations of Sodankylä and Lamont with climatological profiles from the four-dimensional variational (4D-Var) data assimilation system based on the TM5 atmospheric transport model and the NOAA Earth System Research Laboratory observational data, and validate the model performance.



**Figure 1.** Comparisons of integrated AirCore averages of CO<sub>2</sub>, CH<sub>4</sub>, and CO with TCCON retrievals at Sodankylä (black lines show the calibration used by the current version of the TCCON retrievals and red lines are for the AirCore comparisons).