



Side-by side intercomparison between two TCCON instruments

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The Total Carbon Column Observing Network (TCCON) observes column-averaged dry-air mole fractions of CO₂, CH₄, CO, N₂O, and other trace gases at more than 20 stations worldwide. These measurements are the calibration basis for all current and many future satellite greenhouse-gas-observing missions. TCCON's goal is to provide the most precise and accurate data with uncertainties better than 0.25%. Especially inter-station biases in the network are critical and should be reduced to a minimum.

TCCON uses Fourier Transform Spectrometers (FTS) which are comparatively large and expensive instruments that are not easily moved around. In the network, the typical distance between TCCON stations is hundreds to thousands of kilometers. Therefore, opportunities to directly compare the performance of TCCON instruments are very rare. In 2010, the TCCON instrument from the Max Planck Institute for Biogeochemistry (MPI-BGC) in Jena, Germany, was set up close to a TCCON instrument at the University of Wollongong, Wollongong, Australia, for six months. This was part of a test campaign before the final deployment of the MPI-BGC instrument to Ascension Island.

Due to problems with the acquisition and processing of TCCON data at the time, the results of the intercomparison were inconclusive at first. Spectroscopic artifacts known as ghosts affected TCCON data until 2011. The ghosts created relatively large biases between individual instruments that were in the range of TCCON's precision and accuracy goals. The ghost problem was fixed by a hardware upgrade for all TCCON instruments in 2011 but still remained in older data. Only with the latest TCCON processing software GGG2014, the ghosts could finally be removed from the pre-2011 TCCON data. Therefore, a detailed side-by-side intercomparison between the two TCCON instruments at Wollongong in 2010 has now become possible.