

Comparison of XCO abundances measured in the MIR (NDACC) and NIR (TCCON) using Karlsruhe Fourier Transform Infrared (FTIR) measurements

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We present a comparison of Karlsruhe XCO records from the Total Carbon Column Observing Network (TCCON) and retrieved from the spectral region covered by the Network for the Detection of Atmospheric Composition Change (NDACC). The Karlsruhe FTIR instrumental setup allows simultaneous measurements of solar spectra in the mid infrared (MIR) and near infrared (NIR) spectral domains which makes Karlsruhe a good site to directly compare measurements from both spectral regions.

Understanding differences in column abundances from both networks is of high interest for model studies and satellite validations using data from both networks yielding a wider spatial and temporal coverage. However, a direct comparison of long-term timeseries retrieved in different wavelength regions is not trivial. Different factors influence the retrieved trace gas columns from different spectral regions.

We observe a quasi-periodic bias of about 4.8 % between both XCO datasets with a standard deviation of 2.3 % in the seasonal variation. We identify different sources which contribute to the observed bias (airmass-independent correction factor, airmass-dependent correction factor, isotopic identities, differing a priori volume mixing ratio profiles) and quantify their contributions. The seasonality in the residual of NDACC and TCCON XCO can be estimated by the smoothing effect caused by different MIR and NIR averaging kernel sensitivities.

This study aims to improve the comparability of NDACC and TCCON XCO measurement as desired for potential future satellite missions like the Sentinel 5 Precursor.