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# Multi-station intercomparison of column-averaged methane from NDACC and TCCON: Impact of dynamical variability

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The Network for the Detection of Atmospheric Composition Change (NDACC) uses solar FTIR measurements in the mid-infrared (MIR) and offers the potential to complement the near-infrared (NIR) soundings from the Total Carbon Column Observing Network (TCCON) as to spatio-temporal coverage via additional sites and data dating back up to 15 years before TCCON operations began. This can be beneficial for joint trend studies, satellite validation, or the inverse modeling of sources and sinks.

In a recent paper, we performed the first intercomparison of column-averaged methane (XCH4) retrieved from solar FTIR measurements of NDACC versus TCCON. This study was based on multi-annual MIR and NIR measurements from two stations operating both measurement modes (Garmisch, 47.5 N, Wollongong, 34.5 S). The differing a priori impact was reduced by using ACTM-simulated profiles as a common prior. After this correction the absolute levels and seasonalities of the MIR and NIR time series showed a good agreement (Sussmann et al., 2013).

In extension to this previous work we investigate now upgraded retrievals with longer temporal coverage and include three additional stations (Ny-Alesund, 78.9 N, Karlsruhe, 49.1 N, Izana, 28.3 N) thereby representing a diversity of geophysical conditions. After the confirmation of the results from Sussmann et al. (2013) for the new stations, the focus is put on the residual differences between MIR and NIR XCH4 which are still present after correction to a common ACTM a priori profile. We are able to show that these differences are a result of different smoothing effects caused by dynamical variability in the UTLS region, such as stratospheric subsidence and stratosphere-troposphere exchange (STE). For this purpose we present a case study for stratospheric subsidence induced by the polar vortex at Ny Alesund and another case study for a deep stratospheric intrusion event at Garmisch. Exclusion of measurements impacted by such processes leads to an improved agreement of the MIR and NIR XCH4 data set.

Our results indicate that dynamical variability can significantly impact XCH4 retrievals both in the MIR and NIR in a differing manner. This finding will be relevant when it comes to a combined use of NDACC and TCCON XCH4 data.

Reference

Sussmann, R., Ostler, A., Forster, F., Rettinger, M., Deutscher, N. M., Griffith, D. W. T., Hannigan, J. W., Jones, N., and Patra, P. K.: First intercalibration of column-averaged methane from the Total Carbon Column Observing Network and the Network for the Detection of Atmospheric Composition Change, Atmos. Meas. Tech., 6, 397-418, doi:10.5194/amt-6-397-2013, 2013.