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First comparison of column-averaged methane derived from near-infrared and mid-infrared solar spectra

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There exist two global networks of ground-based, solar Fourier transform spectrometers measuring column averaged methane in the near-infrared (NIR) and the mid-infrared (MIR) spectral range, respectively. I.e., the Total Carbon Column Observing Network (TCCON) and the Network for the Detection of Atmospheric Composition Change (NDACC). A combination of both data sets is highly desirable for applications like trend evaluations or satellite validation. A thorough inter-calibration is a prerequisite for this task, however. This is the goal of this ongoing study.

Continuous alternating measurements in these two spectral ranges are performed at the sites Garmisch (47.48° N, 11.06° E, 745 m a.s.l.), Bremen (53.11° N, 8.85° E, 29 m a.s.l.), .), Izana (28.30° N, 16.48° W, 2367 m a.s.l.), Karlsruhe (49.10° N, 8.44° E, 111 m a.s.l.), Ny Alesund (78.92° N, 11.92° E, 20 m a.s.l) and Wollongong (34.41° S, 150.88° E, 40 m a.s.l.). These data are used here to quantify potential biases on column-averaged methane between NIR and MIR measurements, i.e. to derive a MIR/NIR-XCH4-intercalibration factor or function. For the MIR retrievals one common update of the existing, harmonized NDACC retrieval strategy for methane (e.g., Forster et al., 2010) is applied at all sites. At the same time, the NIR retrievals are harmonized via the common use of the newest-version GFIT algorithm with identical settings. Airmass-dependent artifacts due to the differing MIR and NIR spectroscopy can impact the XCH4 annual cycles on a 1% level, which is comparable to the amplitude of the seasonal cycle for clean air sites. The coincident MIR and NIR FTS operations are a possibility to assess residual airmass-dependent artifacts to reach error levels significantly below 1%. Additionally, artificial spectral lines caused by a periodic laser mis-sampling (ghosts) can interfere with the spectral range of interest. The influence of this effect upon the MIR-NIR intercomparison will be investigated. The poster will show the ground-based FTS set-ups and discuss preliminary intercomparison results.

Reference

Forster, F., Sussmann, R., Borsdorff, T., Rettinger, M., Blumenstock, T., Buchwitz, M., Burrows, J.P., Duchatelet, P., Frankenberg, C., Hannigan, J., Hase, F., Jones, N., Klyft, J., Mahieu, E., De Mazière, M., Mellqvist, J., Notholt, J., Petersen, K., Schneising, O., Strong, K., Taylor, J., Vigouroux, C.: Strategy for harmonized retrieval of column-averaged methane from the mid-infrared NDACC FTS-network and intercomparison with SCIAMACHY satellite data on global scale, Geophysical Research Abstracts, Vol. 12, EGU2010-4447-5, 2010, EGU General Assembly 2010.