

5. Remark on non-comparability to near infrared TCCON retrievals

In our work we investigate CH₄ retrievals applying high resolution solar absorption spectra of the mid-infrared spectral region (typical spectral resolution is 0.005 cm⁻¹). Such spectra have been measured since the mid 1990s in the framework of the NDACC. In addition to NDACC a new ground-based FTIR network has been established during the last few years. This new network is called TCCON (Total Carbon Column Observing Network) and it applies very high quality FTIR spectrometers. Within TCCON spectra are measured in the near infrared at a spectral resolution of 0.02 cm⁻¹.

It is very important to make clear that our results obtained for the mid-infrared NDACC retrievals cannot be transferred to the near infrared TCCON retrievals. There are some important differences:

(1) The CH₄ signatures in the TCCON near infrared spectra are much less sensitive to the vertical distribution of CH₄ than the respective signatures in the NDACC mid-infrared spectra. First, in the near infrared the Doppler core is more important than in the mid-infrared, and second, the spectral resolution of TCCON spectra is significantly lower than the one of the NDACC spectra. Consequently, in the near infrared (TCCON) already a scaling retrieval might produce a very precise CH₄ total column. Profile retrievals might not be necessary.

(2) The TCCON near infrared observations have the great advantage that the observed airmass can be monitored by analyzing O₂ absorption signatures. Since atmospheric O₂ amounts are very stable one can use the CH₄/O₂ ratio as a measure of the column-averaged CH₄ amount. Thereby the measurement is a relative measurement and TCCON CH₄ columns are theoretically very precise.

For these reasons in the near infrared (TCCON) the HF correction method can work very well (see also Washenfelder et al., 2003), although and as shown in our work it does not work sufficiently well when analyzing mid-infrared NDACC spectra.