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CO_2 profile retrievals from TCCON spectra

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The Total Carbon Column Observing Network (TCCON) is a global network of ground-based Fourier Transform Spectrometers recording direct solar spectra in the near-infrared spectral region. With stringent requirements on the instrumentation, data processing and calibration, accurate and precise column-averaged abundances of CO_2, CH_4, N_2O, HF, CO, H_2O, and HDO are retrieved being an essential contribution for the validation of satellite data (e.g. GOSAT, OCO-2) and carbon cycle research (Olsen and Randerson, 2004).

However, the determined column-averaged dry air mole fraction (DMF) contains no information about the vertical CO_2 profile, due to the use of a simple scaling retrieval within the common TCCON analysis, where the fitting algorithm GFIT (e.g. Yang et al., 2005) is used.

In this presentation we will apply a different procedure for calculating trace gas abundances from the measured spectra, the fitting algorithm PROFFIT (Hase et. al., 2004) which has been shown to be in very good accordance with GFIT. PROFFIT additionally offers the ability to perform profile retrievals in which the pressure broadening effect of absorption lines is used to retrieve vertical gas profiles, being of great interest especially for the CO_2 modelling community. A new analyzing procedure will be shown and retrieved vertical CO_2 profiles of the TCCON sites Izaña (Tenerife, Canary Islands, Spain) and Lamont (Oklahoma, USA) will be presented and compared with simultaneously performed surface in-situ measurements and CO_2 profiles from different aircraft campaigns.

References: - Hase, F. et al., J.Q.S.R.T. 87, 25-52, 2004.

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