



NDIR surface in situ and FTIR remote sensing measurements at the Jungfraujoch see different CO trends

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Carbon monoxide (CO) is mainly produced by incomplete combustion of carbon-containing materials (fossil fuels or biomass) and plays an important role in atmospheric chemistry. Its reaction with OH is widely considered as its most important sink, and at the same time it is also the dominant reaction partner for OH (barring strongly polluted or forested areas). As such CO has a strong indirect impact on the growth rates of many important greenhouse gases such as CH₄ and O₃. It also has a direct influence on CO₂ through its oxidation. Therefore obtaining accurate long-term measurements of tropospheric CO concentrations is important, as it improves our understanding of the earth's present and future atmosphere. While the usage of space-borne instruments such as MOPITT, SCIAMACHY and IASI has become increasingly important for measuring the atmospheric composition on a global scale, their use for long term trend analysis is often complicated by system degradation and bias shifts. Thus ground-based measurements are crucial for providing very accurate data with high temporal resolution over extended periods of time, ideally suited for trend analysis and validation purposes. To optimally use the available information, there is, within the atmospheric research community, a strong interest in integrated datasets, combining data from several measurement techniques. Alas, this integration is often hindered by the different characteristics of the data sets, inherent to the measurement techniques used.

Here, two carbon monoxide time series (1997 till 2007) acquired at the high-Alpine research station Jungfraujoch with two well-established measurement techniques, namely in-situ surface concentration measurements using Non-Dispersive Infrared Absorption technology (NDIR), and remote sensing measurements using solar absorption Fourier transform Infrared Spectrometry (FTIR), have been compared. We show that, even if both techniques are able to measure free tropospheric CO concentrations and if factors such as humidity, atmospheric boundary layer intrusions and temporal overlap effects are taken into account, significant differences in their overall trend are observed. Lagranto trajectory model data are used to assess whether these observations can be explained by considering that various source regions contribute differently to both datasets and have different emission trends.