CHANGES in ATMOSPHERIC COMPOSITION DISCERNED from LONG-TERM NDACC MEASUREMENTS: TRENDS in DIRECT GREENHOUSE GASES DERIVED from INFRARED SOLAR ABSORPTION SPECTRA RECORDED at the JUNGFRAUJOCH STATION

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INSTRUMENTATION, OBSERVATIONAL DATABASES AND TOOLS

- Two high-resolution Fourier Transform Infrared (FTIR) spectrometers are operated under clear-sky conditions at the high-altitude International Scientific Station of the Jungfraujoch (46.4°F, 6°F, 5380m a.s.l.), within the framework of the Network for the Detection of Atmospheric Composition Change (NDACC, http://www.ndacc.org).

- We use high-resolution (0.003 to 0.007 cm⁻¹) IR solar absorption spectra recorded year-round since 1984. The measurement density has increased since the early 1990s after the installation of a second interferometer, a Bruker IFS-128R. Signal-to-noise ratios are often larger than 1000, reaching 3500-4000 in the most favorable cases.

- Since the FTIR technique allows recording broadband spectra, features of numerous atmospheric species are available. Among the two dozen gases actually retrieved from Jungfraujoch observations, 10 are direct greenhouse gases (GHGs): water vapor, CO₂, CH₄, N₂O, CF₄, SF₆, CCl₃F, CCl₄F, CHCl₃F₂, and CCl₄.

- Corresponding time series are shown here, we further report about their long-term trends.

- All retrievals have been performed either with the SFIT-1 or the SFIT-2 algorithm (v3.91). The latter code is based on a semi-empirical implementation of the Optimal Estimation Method Formalism of Rodgers [1990]. This code allows in most cases to determine information on the vertical distribution of the species accessible to the ground-based FTIR technique. Various versions of the HITRAN-spectroscopic line parameter compilations have been used here [e.g. Rothman et al., 2009]. Also, cross-sections available for some of the target gases (e.g. the CFCs) have been converted to pseudolines, compatible with the SFIT codes, by G.C. Toon (NASA-JPL).

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