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Trends of CO_2, CH_4 and N_2O over 1985-2010 from high-resolution FTIR solar observations at the Jungfraujoch station

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Two state-of-the-art Fourier Transform Infrared (FTIR) spectrometers are operated at the Jungfraujoch station (46.5°N, 8.0°E, 3580m asl) within the framework of the Network for the Detection of Atmospheric Composition Change (NDACC, visit http://www.ndacc.org). The earliest FTIR observations have been obtained there in 1984. Since then, regular recordings of high-resolution solar absorption spectra have been performed at that site, under clear-sky conditions, allowing to collect almost 29000 observations relevant to the present communication.

We present time series of three greenhouse gases targeted by the Kyoto Protocol: CO_2, CH_4 (and its isotopologue $^{13}CH_4$) and N_2O. These data sets have been obtained with the SFIT-2 algorithm which implements the Optimal Estimation Method of Rodgers (1990). This allows retrieving total columns of the target gases as well as information on their distribution with altitude. For the methane isotopologues and N_2O, a Tikhonov L1 regularization scheme has been applied, as part of an harmonization effort carried out within the European HYMN project (see also Dils et al., 2010; Forster et al., 2010).

Trends –and their associated uncertainties– characterizing these long series as well as the seasonal modulations have been determined with a statistical tool using bootstrap resampling (Gardiner et al., 2008). Trend values will be presented and critically discussed; in particular, we will investigate if significant changes in the rate of accumulations of these four atmospheric gases occurred over the last 25 years.

Numerous additional greenhouse gases are accessible to the FTIR technique. Examples of such trend studies are reported at the EGU General Assembly by Mahieu et al. (2010) and Rinsland et al. (2010).

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