THE TIME SERIES OF CARBON MONOXIDE AT ZUGSPITZE (2962 m) FROM 1990 TO 2008

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Trend Estimates from Selected Data
12-month moving averages of monthly data and linear fit

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Time Series Overview
Remarkable variations on time scales from hours to years, traceable to processes such as meteorological variability and periods of enhanced northern hemispheric biomass burning. Annual average CO mole fractions (1990–2008) between 120 and 148 ppb.

Trend curve shows statistically significant decrease. Average rate ~0.84 ppb yr⁻¹ (lin. regr. on monthly means: ~0.94 ppb yr⁻¹, annual means: ~0.85 ppb yr⁻¹).

Seasonal component of regression curve indicates a decrease of the peak-to-peak amplitudes. Decrease of high-CO episodes is reflecting reductions of European CO emissions.

Seasonal Variations
Average seasonal variations with an April maximum and a broad minimum extending from July to October. Peak-to-peak amplitude of 56 ppb (average CO = 134 ppb). Higher p-t-p amplitude of 72 ppb for the period 1991–1994.

Data fulfilling the RH60/30 criterion show average p-t-p amplitude of 42 ppb (average CO = 119 ppb), with monthly differences to the all-data cycle ranging from 11 to 27 ppb.

Trend Estimates from Selected Data
Specific percentiles (95th, 75th, 25th, 5th) reveal strongest CO decrease of the higher CO concentrations. Low-CO levels (clean air, episodes of subsidence) display no trend or a small positive trend.

Differences in magnitude and sign of CO trends from specific subsets of the data are indicative of different developments of the CO concentrations on regional, continental, and hemispheric scales.

Database and Data Processing
Input data: 1/2-hourly, monthly and annual means

Selected data sets: Monthly percentiles from 5th to 95th percentile of the annual data set.

Time Series Overview
Box and Whisker plots of CO in 1996 and 2003 indicate a change in the monthly concentration distribution. The size of the 25/75th percentile boxes gives evidence of a reduction of the higher CO concentrations during winter and spring.

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