Developing Tools to Assess European Trace Gas Trends

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The GEOmon (Global Earth Observation and MONitoring) project has produced a harmonised data set of trace gases from thirty ground-based measurement stations belonging to a number of regional, national and European air quality networks (e.g. EMEP, GAW).

A variety of tools have been developed in R to evaluate European trace gas trends as a method to assess data quality and the effectiveness of European emission legislation. Long-term O3, NO2 and CO have been characterised at all sites using lowess regression. Additionally, O3 was deseasonalised and linear trends were fitted to and quantified for monthly means, 5th and 95th percentiles (to illustrate changes in mean, background and peak concentrations respectively).

Twenty-four of these sites have data between 1996-2005 (Incl). Analysis of these sites for the time period provides an easily comparable characterisation of continental-scale O3 trends. However, few sites have statistically significant trends during this limited analysis period. The RETRO monthly NOx emissions fluxes at the GEOmon harmonised data sites were plotted from 1985-2000. The introduction of catalytic converters in Europe in 1985 and subsequent EU legislation in 1993 (requiring catalytic converters in all new petrol cars sold), corresponds to a decrease in NOx emissions throughout 1990's for the majority of sites. It is noted that the rate of reduction in NOx emissions decreases from the mid-1990's to 2000 for fifteen locations. This may account for the less pronounced, and reduced statistical significance of, O3 trends during the 1996-2005 period.

Although the spatial distribution of European O3 trends 1996-2005 is inconclusive for the present GEOmon harmonised dataset, the expansion to more European sites may lead to a more detailed characterisation.