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Observations of Europe wide Trends in background and peak O3, CO and NO2 levels

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The GEOMON (Global Earth Observation and MONitoring) project has produced a harmonised data set of trace gases from various ground-based measurement stations. These stations belong to a variety of regional, national and European air quality networks (e.g. EMEP, GAW). Investigations into instrumental calibration and data quality have been carried out in order to make comparison between the sites as accurate as possible for a long time-scale trend analysis.
Ozone seasonal cycles at the various sites have been compared, showing characteristic cycles according to latitude, elevation, vicinity to coastal areas and pollution sources and population nearby. A de-trending of this seasonal cycle revealed long-term variations in ozone and a considerable difference between background and peak ozone trends between sites. National, European and international legislation has aimed at reducing CO and NO2 and correspondingly, reduce O3 levels over the last 20 years but the trends are not as clear cut and reveal that there is not a homogeneous reduction in these species across Europe.
Splitting the data into seasonal periods and also into lower and upper concentration percentiles shows us more clearly how the species vary across Europe. There is a tendency for peak ozone levels to decrease, whilst the background levels have mostly increased. Averages, lower and upper percentiles of these species at the GEOMON stations are shown on European maps and the distribution of annual ozone trends is evaluated. Comparisons with models that estimate the lower and upper percentiles of ozone during summer overestimate ozone levels but not uniformly across Europe.