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Trends of near-surface ozone at different altitudes in Central Europe

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Various methods were used to analyse the seasonal trends of ozone (O3) and Ox (O3+ NO2) at around 20 low-altitude and elevated sites in Central Europe during the period 1992-2002. A multiple linear model was developed in order to account for the meteorological variability at the low-altitude sites, based on a careful selection of the most important explanatory variables.

For most of the stations in the Swiss boundary layer north of the Alps, the trend analysis shows no statistically significant downward trends in the summer medians of daily O3 and Ox maxima, despite the significant reduction in the ozone precursor emissions in Central Europe. Nonetheless, the analysis of the summer 90th percentiles of daily O3 and Ox maxima reveals that the emission reductions had an effect on the highest ozone peaks in the industrialised region around Zurich.

The lower effect of the titration by NO as a consequence of the reduced emissions could partially explain the significantly positive O3 trends in the cold seasons. However, significant upward O3 trends of around 0.5 ppb yr-1 at the elevated sites together with a similar increase in Ox found for most of the low-altitude sites in winter can be associated with increasing European background ozone levels, in agreement with other studies. This could also explain the absence of significantly negative trends in the summer medians of daily ozone maxima. The lower regional ozone production due to the decreased emissions of ozone precursors might have been compensated by increased large-scale background O3 or other processes.

In addition, the variability and trends in ozone at the high altitude stations Jungfraujoch and Zugspitze are compared with those ones from the ozone soundings at Payerne and Hohenpeissenberg, respectively.