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Variability of ozone (O3), nitrogen oxide (NO), nitrogen dioxide (NO2), sulphur dioxide (SO2) and carbon monoxide (CO) at the Puy de Dôme research station (France, 1465m a.s.l.) for the period 1995-2010

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Reactive gases are recognized as precursors of ozone and aerosol and thus an understanding of the trends requires analyses of the respective precursor gases. The primarily emitted nitrogen oxides (NOX = NO + NO2) have a substantial impact on radical chemistry, ozone (O3) formation and aerosol by their atmospheric oxidation to aerosol nitrate. Carbon monoxide (CO) is mostly primarily emitted from combustion processes, but it is also formed in substantial amounts from the oxidation of methane (CH4) and volatile organic compounds (VOC). Due to its high global turn-over rates CO is a major O3 precursor, and it has a strong impact on the oxidizing capacity and thus indirectly on the concentration of the climate gas. O3 is a climate gas itself, however, also strongly involved in NO/NO2 partitioning and oxidizing capacity, thus coupling back on several photochemical processes. Accordingly, impacts on climate are multiple and rather complex. An understanding, however, requires high quality, long-term observations of these reactive species.

Long-term ground based in-situ observations of ozone (O3), nitrogen oxide (NO), nitrogen dioxide (NO2) and carbon monoxide (CO) from the Puy de Dôme research station (France, 1465m a.s.l.) are presented for the period 1995–2010. Due to its character as mountain site, the Puy de Dome station is moderately affected by local anthropogenic emissions.
Diurnal, weekly and seasonal variations are studied and compared with the other mountain European observatories (Pic du Midi (F), Hohenpeissenberg and Zugspitze (D), Sonnblick (A) and Jungfraujoch (CH)).
Trends of the studied compounds are discussed with respect to anthropogenic impacts and vertical mixing.