



Horizontal and temporal evolution of tropospheric NO₂ in Vienna as inferred from car DOAS measurements

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Zenith-sky measurements were performed with a car DOAS (Differential Optical Absorption Spectroscopy) instrument to obtain tropospheric nitrogen dioxide (NO₂) distributions within the metropolitan area of Vienna, Austria, on nine days in April, September, October, and November 2015. Several single car journeys having an approximate distance of 110 km and covering known emission sources of nitrogen oxides (NO_x) as well as a background region north of Vienna were carried out.

The spectral measurements are analyzed using the DOAS technique applying a nonlinear least-squares fitting algorithm. The obtained NO₂ differential slant column densities (DSCDs) are based on the 425-490 nm fitting window and the inclusion of relevant high resolution absorption cross-sections. Tropospheric NO₂ vertical column densities (VCDs) are extracted from the NO₂ DSCDs by making assumptions on the diurnal variation of stratospheric NO₂ VCDs and determining a tropospheric NO₂ airmass factor. Additional meteorological (wind speed and wind direction) and air quality (surface NO₂ concentrations) data from nearby measurement stations is used to interpret the horizontal and temporal evolution of NO₂ pollution.

Our results show that elevated NO₂ pollution originating from rush-hour traffic over busy highways is transported along the Danube River to the Northwest of Vienna under certain meteorological conditions.