



High-resolution NO₂ maps of Rotterdam and Zürich retrieved from the APEX imaging spectrometer

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In urban areas, nitrogen dioxide (NO₂) concentrations have high spatial and temporal variability making high-resolution NO₂ maps an important tool for air pollution assessment and epidemiological studies. We retrieved high-resolution NO₂ maps from the Airborne Prism Experiment (APEX) imaging spectrometer measured over Zürich on 30. August 2013 (11:24–12:05 UTC) and Rotterdam on 17. September 2014 (8:53–10:18 UTC).

Our updated retrieval fits NO₂, O₃, O₄, H₂O and the Ring effect between 440 and 510 nm using Differential Optical Absorption Spectroscopy (DOAS). The radiance spectra were spectrally calibrated using a high-resolution solar reference spectrum to correct spectral shifts in across- and along-track direction. Air mass factors were computed using the SCIATRAN radiative transfer model.

The retrieved NO₂ maps have 50×50m² resolution and cover an area of 10×26 km² for Zürich and 10×50 km² for Rotterdam. The maps show enhanced NO₂ values in populated areas and at least three strong plumes from oil refineries in Rotterdam. A comparison with ground measurements in Rotterdam shows only weak correlation, because most of the NO₂ is found in elevated plumes.

In conclusion, airborne observations allow mapping of the NO₂ distribution in urban areas providing a different perspective on urban air quality which cannot be acquired by ground-based observations. The obtained maps will be used for further analysis such as estimating NO_x emissions from oil refineries and comparison with urban-scale chemistry transport modelling.