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Spatially resolved measurements of nitrogen dioxide in an urban environment using concurrent multi-axis differential optical absorption spectroscopy

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Abstract. A novel system using the technique of concurrent multi-axis differential optical absorption spectroscopy system has been developed and applied to the measurement of nitrogen dioxide in an urban environment. Using five fixed telescopes, slant columns of nitrogen dioxide, ozone, water vapour, and the oxygen dimer, O₄, are simultaneously retrieved in five vertically separated viewing directions. The application of this remote sensing technique in the urban environment is explored.

Through the application of several simplifying assumptions a tropospheric concentration of NO₂ is derived and compared with an urban background in-situ chemiluminescence detector. Trends derived from remote sensing and in-situ techniques show agreement to within 15 to 40% depending on conditions. Owing to the high time resolution of the measurements, the ability to image and quantify plumes within the urban environment is demonstrated. The CMAX-DOAS measurements provide a useful measure of overall NO₂ concentrations on a city-wide scale.

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