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Hemispherical Scanning Imaging DOAS: Resolving nitrogen dioxide in the Urban Environment.

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Imaging DOAS techniques have been used for nitrogen dioxide and other trace species for a number of years. This presentation describes a novel system which images concentrations of nitrogen dioxide by scanning an imaging spectrometer through 360 degrees azimuthally, covering a region from 5 degrees below the horizon, to the zenith. Results are presented from measurement campaigns in Bologna and London in 2012, including a significant enhancement event during a thunderstorm. Approaches using NO_2 as a tracer for investigations into anthropogenic emissions and boundary layer dynamics are also discussed.

The bespoke hemispherical Scanning Imaging (HSI) DOAS instrument consists of an imaging spectrometer based on an Offner Relay with Schwarzchild entrance optics. The instantaneous field of view of the instrument is 95 degrees vertically and 0.5 degrees azimuthally. This is rotated at 1 degree per second to provide complete hemispherical coverage in 6 minutes. Data is binned into 2x2 degrees to allow RMS fitting errors below 1x10-3, and slant column retrievals of NO_2 which show significant structure of the full urban boundary layer. In total, 3 HSI-DOAS instruments have been built and operated by the University of Leicester, providing the potential for tomographic retrievals of the 3D structure of NO_2 in the space between the instruments. The latest results from these approaches will also be presented.