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Direct observation of two dimensional trace gas distributions with an airborne Imaging DOAS instrument

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Abstract. In many investigations of tropospheric chemistry information about the two dimensional distribution of trace gases on a small scale (e.g. tens to hundreds of metres) is highly desirable. An airborne instrument based on imaging Differential Optical Absorption Spectroscopy has been built to map the two dimensional distribution of a series of relevant trace gases including NO₂, HCHO, C₂H₂O₂, H₂O, O₄, SO₂, and BrO on a scale of 100 m.

Here we report on the first tests of the novel aircraft instrument over the industrialised South African Highveld, where large variations in NO₂ column densities in the immediate vicinity of several sources e.g. power plants or steel works, were measured. The observed patterns in the trace gas distribution are interpreted with respect to flux estimates, and it is seen that the fine resolution of the measurements allows separate sources in close proximity to one another to be distinguished.

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