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Azimuthal variability of trace gases and aerosols measured during MADCAT in summer 2013 in Mainz, Germany

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With the MAX-DOAS technique it is possible to retrieve vertical profiles of trace gases and aerosols in the lower troposphere. Often these instruments monitor the atmosphere in one azimuthal direction only. Therefore horizontal variability is not resolved. Thus especially the comparison to satellite data close to strong emission sources, one main application of MAX-DOAS, is possibly biased.
MADCAT (Multi-Axis DOAS Comparison campaign for Aerosols and Trace gases) took place in summer 2013 in Mainz, a city in the Rhine-Main region close to Frankfurt, with high population density and industrial complexes. The main focus of this campaign was on the comparison of the results from the different instruments. Therefore 16 MAX-DOAS instruments from 10 different institutes were operated on the roof of the MPI for Chemistry. In standard operation mode, vertical scans at one selected azimuth viewing direction were performed. In addition, 6 instruments scanned the sky also horizontally every two hours. The scans were performed under a low elevation angle (2°) to capture the pollution close to the ground. These measurements give us the unique opportunity to investigate the horizontal distribution of trace gases.
Additionally, car-DOAS measurements were performed at least twice a day that encircled the city with a radius of ca. 10km. These allow to assess the information content of the multi-azimuth MAX-DOAS observations. Comparisons will be shown for different trace gases like NO_2, O_4 or HCHO.