Airborne measurements of spatial NO$_2$ distributions during AROMAT

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1. AROMAT campaign
- The AROMAT (Airborne Romanian Measurements of Aerosols and Trace Gases) campaign was held in September 2014.
- Dedicated to comparison of multiple remote sensing and in-situ instruments for satellite data validation.
- Many European research institutions involved.
- Two target sites: City of Bucharest (Urban emissions from transport and industry) and Jiu Valley (Two large power plants with high emissions and localized plumes).
- Shown here: Are solely measurements in the Bucharest area.

2. Instrumental setup and method
- Scatter sunlight from below the aircraft is collected and fed into an imaging spectrometer via an sorted fiber bundle (35 individual fibers), retaining the spatial information.

   ![Instrumental setup](image1)

3. NO$_2$ maps of Bucharest
- AirMAP is successfully used during AROMAT to create high resolution NO$_2$ maps of Bucharest and in addition (not shown here) the Turceni power plant.
- First inter-comparison with results from car DOAS instruments looks promising.
- Deviations between instruments can partly be explained by geometric considerations of observed air masses, but further investigation is needed.
- Improvement of instrumental setup to allow simultaneous retrieval of SO$_2$ and other trace gases in the UV spectral range.

   ![NO$_2$ map](image2)

4. Comparison to mobile car-DOAS measurements
- On the day 2014-09-08 (Fig. 4 top) mobile car-DOAS measurements were performed in coordination with the AirMAP flights.
- Shown below is a comparison of the differential slant column densities (DSCDs) measured by a zenith looking mobile car-DOAS system operated by the University of Galati and BIRA to DSCDs from AirMAP.
- For the comparison both datasets were gridded to 0.001° x 0.001° = 100 m$^2$.

   ![Comparison to mobile car-DOAS](image3)

5. Summary & Outlook
- AirMAP was successfully used during AROMAT to create high resolution NO$_2$ maps of Bucharest and in addition (not shown here) the Turceni power plant.
- First inter-comparison with results from car DOAS instruments looks promising.
- Deviations between instruments can partly be explained by geometric considerations of observed air masses, but further investigation is needed.
- Improvement of instrumental setup to allow simultaneous retrieval of SO$_2$ and other trace gases in the UV spectral range.

   ![Summary & Outlook](image4)

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Selected references