



## **Airborne measurements of NO<sub>2</sub> shipping emissions using imaging DOAS**

Andreas C. Meier (1), Anja Schönhardt (1), Andreas Richter (1), André Seyler (1), Thomas Ruhtz (2), Carsten Lindemann (2), Folkard Wittrock (1), and John P. Burrows (1)

(1) Institute of Environmental Physics, University of Bremen, Bremen, Germany (ameier@iup.physik.uni-bremen.de), (2) Institute for Space Science, FU Berlin, Berlin, Germany

NO<sub>x</sub> (NO and NO<sub>2</sub>) play a key role in tropospheric chemistry and affect human health and the environment. Shipping emissions contribute substantially to the global emissions of anthropogenic NO<sub>x</sub>. Due to globalization and increased trade volume, the relative importance emissions from ships gain even more importance.

The Airborne imaging DOAS instrument for Measurements of Atmospheric Pollution (AirMAP), developed at IUP Bremen, has been used to perform measurements of NO<sub>2</sub> in the visible spectral range. The observations allow the determination of spatial distributions of column densities of NO<sub>2</sub> below the aircraft. Airborne measurements were performed over Northern Germany and adjacent coastal waters during the NOSE (NO<sub>2</sub> from Shipping Emissions) campaign in August 2013. The focus of the campaign activities was on shipping emissions, but NO<sub>2</sub> over cities and power plants has been measured as well. The measurements have a spatial resolution below the order of 100 × 30 m<sup>2</sup>, and they reveal the large spatial variability of NO<sub>2</sub> and the evolution of NO<sub>2</sub> plumes behind point sources. Shipping lanes as well as plumes of individual ships are detected by the AirMAP instrument. In this study, first results from the NOSE campaign are presented for selected measurement areas.