



## **Simultaneous aircraft measurements of NO, NO<sub>2</sub>, HONO, and $j_{NO_2}$ to test the HO<sub>x</sub>/NO<sub>x</sub> photo-chemical budget and the HONO steady state in the middle troposphere**

Benjamin Schreiner (1), Meike Rotermund (1), Flora Kluge (1), Klaus Pfeilsticker (1), Andreas Zahn (2), Helmut Ziereis (3), Birger Bohn (4), and Tilman Hüneke (1)

(1) Institut für Umweltphysik, Universität Heidelberg, Heidelberg, Germany (bschrein@iup.uni-heidelberg.de), (2) IMK-ASF, Karlsruhe Institute of Technology, Karlsruhe, Germany, (3) Institute of Atmospheric Physics, Deutsches Zentrum für Luft und Raumfahrt, Oberpfaffenhofen, Germany, (4) Institute of Energy and Climate Research, Forschungszentrum, Jülich, Germany

Middle and long-term photo-chemical effects of local and regional pollution are not well quantified and are an area of active study. NO<sub>x</sub> (here defined as NO, NO<sub>2</sub>, and HONO) is a regional pollutant, which influences atmospheric oxidation capacity and thus ozone formation. Airborne measurements in the boundary layer and free troposphere of atmospheric trace gases from the HALO (High Altitude Long Range) aircraft, particularly of NO, NO<sub>2</sub>, and HONO were performed as part of the EMERGe (Effect of Megacities on the Transport and Transformation of Pollutants on the Regional to Global Scales) campaign over continental Europe and southeast Asia in July 2017 and April 2018, respectively. NO (and NO<sub>y</sub>), O<sub>3</sub>, and the photolysis frequencies of NO<sub>2</sub> and HONO were measured in-situ. NO<sub>2</sub> and HONO were inferred from Limb measurements of the mini-DOAS (Differential Optical Absorption Spectroscopy) instrument, using the novel scaling method (Hüneke et al., 2017). The combination of these measurements allows us to study the oxidation capacity via the Leighton ratio (which indicates ozone formation) and the HO<sub>x</sub>/NO<sub>x</sub> coupling by quantifying the formation/destruction of HONO. The differences between these two studied regions are discussed along with the relevant processes which characterize the different air masses and photo-chemical regimes.