Geophysical Research Abstracts
Vol. 15, EGU2013-3514, 2013
EGU General Assembly 2013

Horizontal and vertical distribution of bromine monoxide in northern Alaska during BROMEX derived from airborne imaging-DOAS measurements

Denis Pöhler (1), Stephan General (1), Johannes Zielcke (1), Paul B. Shepson (2,3), Holger Sihler (1,4), Brian H. Stirm (5), Udo Frieß (1), Kerry A. Pratt (2), Steve Walsh (6), William R. Simpson (6), and Ulrich Platt (1)

(1) University of Heidelberg, Institute of Environmental Physics, Heidelberg, Germany (denis.poehler@iup.uni-heidelberg.de, +49 6221 546405), (2) Department of Chemistry, Purdue University, West Lafayette, IN, (3) Department of Earth, Atmospheric, and Planetary Sciences & Purdue Climate Change Research Center, Purdue University, West Lafayette, IN, (4) Max Planck Institute for Chemistry, Joh.-Joachim-Becher-Weg 27, 55128 Mainz, Germany, (5) Department of Aviation Technology, Purdue University, West Lafayette, IN, (6) Department of Chemistry and Biochemistry, University of Alaska Fairbanks, Fairbanks, AK

Bromine monoxide (BrO) is a reactive halogen species (RHS) and has been known for quite a while to have a profound impact on the chemistry of the polar tropospheric boundary layer. Details of the bromine release and reaction processes are still unclear, especially the role of frost flowers, first-year sea ice, aerosols, atmospheric stability and snow.

To investigate important details of the bromine release, a novel imaging DOAS instrument for the ultraviolet wavelength range (300 to 400 nm) was deployed aboard a light twin-engine aircraft (ALAR, Purdue Univ.) as part of the BRomine, Ozone, and Mercury EXperiment (BROMEX) in Barrow, Alaska, in spring 2012. This instrument utilizes (1) a scanner system in nadir direction to map trace gas distributions of the overflown area at high spatial resolution and (2) a forward-looking system, to observe the vertical trace gas distribution. Both viewing directions are equipped with digital cameras, enabling the creation of aerial maps and the comparison of spectral data with background features. We derived horizontal and vertical distribution of bromine monoxide (BrO) and other gases (e.g. NO_2) over a wide variety of sea, ice and land surface conditions (first-year sea ice, frost flowers, open leads, and arctic tundra).

We observed strong horizontal gradients of BrO within few km and a fast movement of BrO plumes. Distributions change significantly within few hours. The data show interesting correlations to the different surfaces. Additionally a clear anti-correlation of BrO and NO_2 can be observed. Tropospheric BrO-distributions derived from satellite observations match within the satellite resolution those seen with the aircraft. Vertical gradients show a shallow layer of BrO close to the surface. These and other results from the 11 flights will be presented together with conclusions of the involved chemistry.