Geophysical Research Abstracts
Vol. 15, EGU2013-8584-1, 2013
EGU General Assembly 2013

Vertical distribution of BrO and aersols at the Dead Sea Valley

Robert Holla (1), Stefan Schmitt (1), Jutta Zingler (2), Udo Friess (1), Ulrich Corsmeier (3), Christoph Kottmeier (3), and Ulrich Platt (1)

(1) University of Heidelberg Institute for Environmental Physics, (2) Karlsruher Institut für Technologie (KIT) Fortbildungszentrum für Technik und Umwelt (FTU), (3) Karlsruher Institut für Technologie (KIT) Institut für Meteorologie und Klimaforschung

The Dead Sea Valley (DSV) is known for its unique topographic and atmospheric conditions. In summer, the meteorological conditions are quite stable. Thus, atmospheric chemistry can be investigated under reproducible conditions. This and the large abundance of bromine monoxide (BrO) makes it a perfect natural laboratory to gain insight into the bromine chemistry in the lower troposphere. Thus the DSV can serve as a model for other salt lakes or saline soil areas where the boundary conditions are less suitable for field measurements.

During the last years, several measurements of Reactive Halogen Species (RHS) were performed in the DSV and at other salt lakes, however, the sources of RHS and the contributions of different release processes are not fully understood yet. Open questions are: What are the main sources of the BrO release and to which extent are aerosols involved? Which meteorological conditions favor the BrO release and what is the impact of NO_x on the bromine chemistry?

Focussed on these questions, an extensive field campaign was performed in the framework of the DFG project HALOPROC. For the first time vertical profiles of BrO and NO_2 at the Dead Sea were determined and interpreted in terms of the special atmospheric dynamics in the Dead Sea Valley. This was achieved by combining a Long-path(LP)-DOAS instrument, situated at Ein Bokek, with three Multi-AXis(MAX)-DOAS instruments, two stationary (Ein Bokek and Masada Top) and one mounted on a car. Ground level abundances of BrO and NO_2 inferred from MAX-DOAS measurements were validated by LP-DOAS and show very good agreement. On several days, elevated layers of BrO and aerosols could be observed in different altitudes by the MAX-DOAS instruments. This could be an indication for vertical transport barriers induced by convective inversion layers leading to an enrichment of aerosol within the Dead Sea Valley. These vertical transport barriers might have an impact on the formation of BrO in two ways: First, BrO emitted by the sea surface is accumulated directly below the transport barrier, and second, enhanced relative humidity might favor heterogeneous bromine release from aerosols. BrO mixing ratios of more than 100 ppt were found close to the ground and in several hundred meters above ground level. NO_2 levels below 1-2 ppb seem to be a prerequisite for a high BrO production. Our measurements indicate a strong dependence of BrO release on the topography and local and meso-scale meteorology.