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Detection of halogen activation and "BrO explosions" in the Arctic in spring 2007

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During the ASTAR campaign ("Arctic Study of Tropospheric Aerosol, Clouds and Radiation") taking place in Svalbard (78˚ N, 15˚E), limb scattered skylight measurements were performed in April 2007 from aboard the DLR (Deutsche Zentrum fuer Luft- und Raumfahrt) Falcon aircraft. Our primary goal was to deploy and test a novel air-borne limb-scanning miniDOAS instrument (Weidner et al., 2005) and to measure vertical profiles of O_3, NO_2, BrO, OClO, IO, OIO, $C_2H_2O_2$, CH_2O, H_2O and O_4 in the arctic atmosphere from the boundary layer up to the lowermost stratosphere.

The deployed new miniDOAS instrument proved to be suitable for air-borne measurements by showing the feasibility of detecting trace-gases with small (pptv) mixing ratios. In particular, our results from ASTAR confirm that bromine explosions occurred above the sea-ice in clear-air conditions in April 2007.

Special emphasis will be put on the investigation of auto-catalytic halogen reactions in near boundary layer air masses above sea-ice. In particular, our DOAS data analysis focused on the detection of BrO (Aliwell et al, 2002), showing active bromine enhancements in most of the low-altitude flights above sea-ice. Data from the lowest flight performed during the campaign (8^{th} April) will be presented in detail. Combined with radiative transfer calculations calibrated with the "oxygen dimer" O_4, our BrO profile analysis showed maximum mixing ratios of 50 ± 15pptv. The observed en-

hancements of tropospheric bromine are anticorrelated with measured in-situ ozone (H. Schlager, P. Stock, DLR) confirming nearly complete destruction of ozone in the polar boundary layer (detection limit 3ppbv) by tropospheric BrO.