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BrO profiling in the arctic troposphere during spring 2007

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A limb scanning mini-DOAS instrument was deployed on the DLR-Falcon aircraft during the ASTAR 2007 campaign ("Arctic Study of Tropospheric Aerosol, Clouds and Radiation", IPY 2007/8) that took place at Svalbard (78^oN) in April 2007. The novel technique proved to be suitable for sensitive air-borne detection of some key radicals (e.g., BrO detection limit $\sim$1.5 pptv) in the atmospheric photochemistry.

Specific results obtained during the ASTAR 2007 campaign are: (1) first deployment of a novel aircraft-borne mini-DOAS limb instrument and demonstration of its feasibility, (2) the implementation of a novel retrieval method independently tested with an absorber with known profile (O_4), (3) the development of a satisfactory aerosol inversion scheme in order to account properly for the radiative transfer, and (4) the sensitive detection of tropospheric BrO profiles having $\sim$10 degrees of freedom while using no BrO a priori information.

During the arctic spring, our BrO profile measurements indicate (a) large BrO concentrations ($\sim$15 pptv) during ozone depletion events within the boundary layer, (b) low BrO concentrations ($\leq$ 1.5 pptv) in the free troposphere, (c) occasionally enhanced BrO ($\sim$1.5 pptv) in the upper troposphere, and (d) increasing BrO with altitude in the lowermost stratosphere, well in agreement with other observations (satellite and balloon soundings).

Furthermore, our BrO profiles are compared with total atmospheric Vertical Column Densities (VCD) detected by satellites (GOME II, ENVISAT/SCIAMACHY) and integrated stratospheric profiles (e.g. measured by our direct sunlight DOAS instrument on board balloon platforms). Overall, the comparison of our data indicate, within the errors, consistency with data from each of the other methods.