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Diurnal variations of $BrONO_2$ observed by MIPAS-B at mid-latitudes and in the Arctic

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Despite being much less abundant, the contribution of bromine to stratospheric ozone depletion is similar to that of chlorine. Moreover, against the background of abating levels of chlorine in the stratosphere, bromine will become more and more important due to its natural sources. The two major inorganic bromine species in the lower stratosphere are bromine monoxide (BrO) and bromine nitrate ($BrONO_2$) - the relative abundances of which are mainly controlled by photochemical processes. While BrO has first been observed around 20 years ago, $BrONO_2$ has been detected by satellite limb observations in the mid-infrared spectral region only recently (in 2008).

Two Arctic flights of the balloon-borne Michelson Interferometer for Passive Atmospheric Sounding (MIPAS-B) were carried out from Kiruna (68 °N, Sweden) in January 2010 and March 2011 inside the stratospheric polar vortices. For the first time, diurnal variations of $BrONO_2$ around sunrise have been observed.

A dedicated balloon flight for simultaneous observation of BrO and $BrONO_2$ including their diurnal variability, took place from Timmins (49 °N, Canada) in September 2014. The remote sounding instrumentation consisted of three spectrometers covering the UV-VIS, the mid-infrared and the sub-mm/microwave spectral region.

In this contribution we present time- and altitude-dependent distributions of $BrONO_2$ and NO_2 volume mixing ratios as measured by MIPAS-B together with a comprehensive error estimation and further diagnostic parameters of the inversion procedure.

Time-dependent vertical profiles of measured species are compared to simulations of the Chemistry Climate Model EMAC (ECHAM5/MESSy Atmospheric Chemistry) and a 1-dimensional photochemical column model.