During each springtime, episodes of strongly increased bromine monoxide concentrations, so called Bromine explosions, are observed in the polar regions by satellite instruments like e.g. SCIAMACHY (see figure 1). The satellite data show, that wide areas can be affected by increased BrO values and that those events last typically for a few days. As BrO is a radical, it has an impact on the oxidation capacity of the atmosphere and its abundance in the polar troposphere is correlated with two further phenomena: The sudden depletion of ozone and of mercury in the polar springtime boundary layer.

In order to investigate these important atmospheric events in more detail, scientists from several institutes perform measurements during the German research vessel Polarstern cruise ANTXXIII-7 which took place in the Antarctic spring from August 23 to October 27, 2006 in the Weddell sea. During this expedition, concerted measurements of BrO, ozone, mercury, surrounding conditions and ice properties were performed. In particular, BrO columns measured with a MAX-DOAS1 instrument on the Polarstern (see figures 2 and 3) have been used to proof the reliability of BrO column values retrieved from measurements of the satellite instruments SCIAMACHY and OMI. On the other hand, the satellite data were used to search for a systematic pattern in the motion of the BrO plumes and for preferred regions for the initialization of the plumes. From this the conditions needed for the initialization of the release process of BrO are inferred.

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1 MAX-DOAS: Multi Axis Differential Optical Absorption Spectroscopy instruments. These instruments are basically UV/visible spectrometers observing scattered light in different viewing directions towards the sky. The standard Bremen MAX-DOAS instrument consists of a grating spectrometer equipped with a cooled CCD detector and a separate telescope unit connected to the main instrument via a quartz fibre bundle. The spectrometer is temperature stabilized to avoid wavelength drifts. Although the CCD used is a 2-dimensional detector, it is operated in full vertical binning for optimal signal to noise. The quartz fibre bundle efficiently depolarizes the incoming light and also provides flexibility for instrument set-up. The telescope unit has two viewing ports, one to the zenith and one to the horizon.
Application Note

One of the main uncertainties in the BrO explosion is on which type of sea ice BrO release processes are most efficient. To further investigate this question a new mobile MAX-DOAS was constructed from scientists of the Institute of Environmental Physics at the University of Bremen (www.doas-bremen.de).

In order to reduce space and energy consumption of the instrument, a combination of a Shamrock SR-163i spectrograph and an iDus DV420A-BU CCD from Andor Technology detector was selected. With that it was possible to measure high quality BrO trace gas columns directly on the Antarctic ice sheet far remote from any external power supply for more than 24 hours (see figures 4, 5 and 6).

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