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Greenland Summit HO_x/Halogen Experiment: 2007 and 2008

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Reactive halogens in Arctic regions and their impact on ozone levels have been a subject of extensive research since the mid 1980s. In particular, studies have focused on coastal regions close to first-year sea ice. Less is known about halogens in more remote regions, such as the Greenland ice sheet. Motivated by indirect evidence of halogen chemistry, two field campaigns have been conducted at Summit, Greenland (altitude 3.2 km, latitude = 72.55°N), in May/June 2007 and June/July 2008. The purpose of these studies was to measure air and snow properties with a particular focus on halogen and HO_x chemistry at Summit.

Measurements of gas phase soluble bromide as well as Differential Optical Absorption Spectroscopy (DOAS) and Chemical Ionization Mass Spectrometer (CIMS) confirm the presence of gas phase reactive bromine at Summit. The most likely source of gas phase bromine is activation of Br⁻ in the snow followed by release of active Br to the overlying air, despite the relatively small concentrations of Br⁻ compared to the coastal Arctic. Mixing ratios of soluble bromide and BrO above the snow were also found to be small (with maxima of ~4 ppt). This amount of bromine can oxidize and contribute to deposition of long-lived gaseous elemental mercury and may perturb HO_x partitioning. A complete description of the experimental set up including the micrometeorological situation at Summit during the campaigns will be presented.

In order to understand the chemical and physical processes occurring during these field experiments we have also developed a 1D model for snow physics and chemistry, coupled to the boundary layer model MISTRA. The model indicates that the observed bromine can be explained by photochemical release from the snow pack.

Please list some keywords

Summit, GSHOX, halogen, NO_x, photochemistry, snow

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