Geophysical Research Abstracts
Vol. 13, EGU2011-5805, 2011
EGU General Assembly 2011

The adsorption of HO_2NO_2 on ice

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Nitrogen peroxides, such as peroxynitric acid (HO_2NO_2) act as reservoir for atmospheric NO_x and HO_x species and thus impact the oxidative capacity of the atmosphere. Mixing ratios of HO_2NO_2 in the range of 76 pptV have been measured in the upper troposphere. The presence of ice in cirrus clouds there may represent a major sink for HO_2NO_2, yet little is known about the partitioning to ice particles of this trace gas.

In this study, the partitioning of HO_2NO_2 between the atmosphere and ice was investigated by coated wall flow tube experiments in the temperature range of -45 °C to -20 °C. The detection was done with a chemical ionization mass spectrometer, using SF6- as ionizing species, allowing for mixing ratios of HO_2NO_2 of around 2-3 ppbV during the experiments.

The temperature dependence of the equilibrium partitioning constant of HO_2NO_2 between air and ice was determined. The partitioning of HO_2NO_2 between air and ice is compared to the IUPAC recommendations for HNO_3; the partitioning coefficients of HO_2NO_2 were found to be orders of magnitude lower than the ones for HNO_3. The adsorption of HO_2NO_2 on ice proved to be fully reversible, as determined by desorption experiments. Further, the atmospheric implications are discussed.