Geophysical Research Abstracts
Vol. 14, EGU2012-13600, 2012
EGU General Assembly 2012

The role of grain boundaries on the uptake of H_2O_2

T. Ulrich (1,2), M. Ammann (1), S. Leutwyler (2), and T. Bartels-Rausch (1)

(1) Paul Scherrer Institute (PSI), Villigen PSI, Switzerland (thorsten.bartels-rausch@psi.ch), (2) University of Bern, Bern, Switzerland

Snow and sea ice are polycrystalline materials. Grain boundaries, the interface where two ice grains meet, can host a variety of contaminants such as sulphuric acid and other inorganic solutes, salts, and organics. They may impact the flux of contaminants between the ocean and sea ice or between air and ice particles or snow. Further, grain boundaries have been proposed to also influence laboratory studies on the uptake of trace gases to ice, where diffusion into grain boundary might be important on longer time-scales.

Here we present the results of a laboratory study showing the role of grain boundaries on the uptake of H_2O_2 from the gas-phase to ice. H_2O_2 was chosen, because it might be the major OH precursor in surface snow, taken its high concentration and its quantum yield. The OH radical is a strong oxidizer involved in polar halogen and nitrogen oxide chemistry and also in the oxidation of organics in snow. Additionally diffusive uptake of H_2O_2 to the bulk ice has been observed in an earlier laboratory studies, but it remains unclear if this can be attributed to uptake into grain boundaries.

Central to this new set-up is a flow reactor, where trace gases can be exposed to an ice surface and the kinetics of the uptake to this sample can be investigated. In particular, the new reactor allows to control and to monitor the total number of grains in an ice sample. The number of individual grains in the ice sample can be modified in a process known as zone refining. It has been used earlier for ice, but never with a planar geometry. The planar geometry of the reactor permits to measure the length of grain boundaries on the surface of ice samples by use of a polarized light microscope. This is a significant improvement, as in earlier studies this quantity was not directly accessible.