Geophysical Research Abstracts, Vol. 7, 09626, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09626

New insights into the microphysics and kinetics of trace gas uptake on ice by using radioactively marked HONO

T. Huthwelker and M. Ammann

Laboratory for Radiochemistry and Environmental Chemistry, Paul Scherrer Imstitute, CH-5232 Villigen, Switzerland

The interaction of various nitrogen oxides, such as HNO_3, HO_2NO_2 or HONO with ice is of interest in several fields of atmospheric science, such as the chemistry in cirrus clouds or in the polar ice. A classical method to study the uptake of trace gases on ice are flow tube experiments. In these experiments a breakthrough curve is measured. The total uptake and sometimes also kinetic parameters can be derived from the shape of the breakthrough curve.

We extend this technique by using radioactively labelled $HO^{13}NO$. Thus, we get additional kinetic information about the trace gas-ice interaction. First, by scanning the radioactivity along the flow tube the trace gas distribution along the tube is determined. Secondly, the amount of radioactive trace gas leaving the ice tube tells about the reversible adsorption of the gas on the ice. Using these data with simultaneous measurement of a classical breakthrough allows to constrain the uptake mechanism. We demonstrate this new approach to study the trace gas uptake on ice using the uptake of HONO on a packed ice bed and compare the result with numerical modelling. This novel technique can be easily applied to other nitrogen containing trace gases, such as HNO_3, or HO_2NO_2.