Geophysical Research Abstracts
Vol. 12, EGU2010-5736, 2010
EGU General Assembly 2010

Solubility and solid state diffusion of Formaldehyde in Ice

Manuel Barret (1), Stephan Houdier (1), Florent Domine (1), Harry Beine (2), Petter Weibring (3), James Walega (3), Alan Fried (3), and Dirk Richter (3)

(1) Laboratoire de Glaciologie et Géophysique de l'Environnement, CNRS/UJF, Grenoble, France, (2) Department of Land, Air, and Water Resources, University of California at Davis, One Shields Avenue, Davis, California, (3) National Center for Atmospheric Research, 3450 Mitchell Lane, Boulder, Colorado

Formaldehyde (HCHO) is an oxidation intermediate of hydrocarbon oxidation and can be an important source of oxidants (HOx) when photolysed. Gaseous HCHO is exchanged between the snowpack and atmosphere. Processes involved include snowpack (1) production from the photo-oxidation of organic matter, presumably present as scavenged aerosol particles or (2) exchanges of HCHO dissolved within snow crystals.

Testing the relative importance of both these processes is difficult in part because we know neither the solubility of HCHO in ice as a function of partial pressure of formaldehyde (P_{HCHO}) and temperature, nor the diffusion rate of HCHO in ice.

We have therefore studied the diffusion and solubility of HCHO in ice by exposing large (8 cm) single crystals of ice to known P_{HCHO} for several weeks. Experiments were performed between -30˚C and -7˚C and allowed the construction of the phase diagram of the solid solution of HCHO in ice. The diffusion coefficient was also measured and values are in the range of 10^{-12} to 10^{-11} $cm^2.s^{-1}$.

Results from this experimental work will be compared to data obtained during the OASIS 2009 field campaign in Barrow where HCHO concentrations were measured both in snow and atmosphere.