Geophysical Research Abstracts
Vol. 14, EGU2012-2715, 2012
EGU General Assembly 2012

Trace gas burial in growing ice

M. Kippenberger, G. Schuster, and J. N. Crowley
Max-Planck-Institut für Chemie, Mainz, Germany

Atmospheric ice is rarely in perfect equilibrium with water vapour but is constantly growing or evaporating. Trace gases impinging on growing ice surfaces can be buried (trapped) in newly formed layers of ice, resulting in repartitioning from the gas to the ice phase and thus impacting on gas- and particle-phase composition and chemistry.

Whilst aircraft observations suggest that trapping takes place in cirrus clouds (Popp et al., 2004, Voigt et al., 2006), there are few quantitative laboratory data describing this effect. We have therefore investigated the trapping of a variety of trace gases on growing ice films with the goal of deepening our understanding of the trapping the process and its dependence on variables such as the ice growth rate, temperature and trace gas partial pressure. Data on the uptake of several organic traces gases and HCl were obtained using a low pressure „ice-growth“ reactor connected to a chemical ionisation mass spectrometer. We present a parameterisation of the trapping efficiency and compare the results to predictions of the trapping model by Kärcher et al. (2009).

References

Kärcher, B., J. P. D. Abbatt, R. A. Cox, P. J. Popp and C. Voigt, Trapping of trace gases by growing ice surfaces including surface-saturated adsorption, Journal of Geophysical Research – Atmospheres, 114, D13306, 2009

Popp, P. J., R. S. Gao, T. P. Marcy, D. W. Fahey, P. K. Hudson, T. L. Thompson, B. Kärcher, B. A. Ridley, A. J. Weinheimer, D. J. Knapp, D. D. Montzka, D. Baumgardner, T. J. Garrett, E. M. Weinstock, J. B. Smith, D. S. Sayres, J. V. Pittman, S. Dhaniyala, T. P. Bui and M. J. Mahoney, Nitric acid uptake on subtropical cirrus cloud particles, Journal of Geophysical Research – Atmospheres, 109, D6, 2004

Voigt, C., H. Schlager, H. Ziereis, B. Kärcher, B. P. Luo, C. Schiller, M. Kramer, P. J. Popp, H. Irie and Y. Kondo, Nitric acid in cirrus clouds, Geophysical Research Letters, 33, L05803, 2006