Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06137, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06137
EGU General Assembly 2008

Ice Clouds and Humidity: A microphysical Perspective

T. Koop (1), B. Zobrist (1,2), C. Marcolli (2), and A. Pedernera (1)

(1) Department of Chemistry, Bielefeld University, Bielefeld, Germany (thomas.koop@uni-bielefeld.de),
(2) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

In the first part of the talk, a general overview will be given of several microphysical processes that are important in determining upper tropospheric humidity. These processes will be discussed with special consideration to observations of high humidities in the upper troposphere that seem to be at odds with our current microphysical understanding. In the second part, a new mechanism will be presented by which organics might influence ice nucleation and growth: the formation of glassy aerosol particles. Glasses are disordered amorphous (non-crystalline) materials that behave mechanically like solids. Glasses can be formed by cooling a liquid until the viscosity increases exponentially and molecular diffusion practically ceases. At this point, many thermodynamic properties of the liquid change abruptly to that of a solid, defining this as the glass transition temperature, Tg. We have experimentally determined the Tg-values and freezing temperatures of aqueous solutions of a variety of organic and inorganic solutes as a function of solute concentration. We show that aqueous solutions of inorganic solutes have Tg-values that are too low to be of atmospheric importance. In contrast, solutions of many organic solutes do form glasses at upper tropospheric temperatures. Our results suggest that ice nucleation as well as ice crystal growth can be significantly reduced and even completely inhibited in organic aerosols at upper tropospheric temperatures with implications for cirrus cloud formation and upper tropospheric relative humidity.