Geophysical Research Abstracts, Vol. 8, 07487, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07487

Aerosol Partitioning in Mixed Phase Clouds and its Implication for Climate

B. Verheggen (1), E. Weingartner (1), K. N. Bower (2), U. Lohmann (3), J. Cozic (1), S. Mertes (4), P. Connolly (2), M. Flynn (2), M. Gallagher (2) and U. Baltensperger (1)

(1) Paul Scherrer Institut, Switzerland, (2) University of Manchester, United Kingdom, (3) ETH Zürich, Switzerland, (4) Leibniz-Institute for Tropospheric Research, Germany (bart.verheggen@psi.ch)

More than 900 hours of in-cloud measurements of the aerosol and hydrometeor properties were made at the Jungfraujoch high alpine site during winter and summer 2004 and winter 2005. The observations made during these Cloud and Aerosol Characterization Experiments (CLACE) were used to parameterize the aerosol partitioning in natural, mid-latitude, mixed-phase clouds.

Air was sampled via three different inlets: A total inlet heated to 25 degrees to evaporate cloud particles, an interstitial inlet operated with a PM2 cyclone impactor to remove cloud particles and an ICE-CVI (Counterflow Virtual Impactor) inlet designed to sample residual particles of small ice crystals. Differencing the number of particles (D $>$ 100 nm) measured downstream of the total and interstitial inlet allows for the quantification of the fraction of aerosol particles activated into cloud droplets. The dependence of this activated fraction on several environmental parameters (particle number concentration, liquid water content, temperature, cloud ice mass fraction) has been investigated. The ice mass fraction (IMF) was quantified based on a combined analysis of the droplet spectrum (using FSSP), ice crystal spectrum (using CPI and 2D-G) and condensed water content (using PVM).

The activated fraction was observed to decrease with increasing IMF from approximately 0.6 in summer liquid phase clouds (IMF = 0) to less than 0.2 in mixed-phase clouds (IMF $>$ 0.05). The latter is attributed to the Wegener-Bergeron-Findeisen mechanism whereby ice crystals grow at the expense of liquid water drops, releasing

formerly activated aerosols back into the interstitial phase. The observed partitioning into the ice phase was used to predict the ice crystal number concentration in a general circulation model, resulting in a significantly smaller shortwave aerosol indirect effect on climate than is generally found.