Name of research institute or organization:

Max Planck Institute for Chemistry, Biogeochemistry Department

Title of project:

Investigation of the cloud condensation nucleus (CCN) activity of aerosol particles

Project leader and team:

Ulrich Pöschl, Sachin Gunthe, Diana Rose

Project description:

The influence of aerosols on clouds and precipitation is one of the central questions of current atmospheric and climate research. The activation of aerosol particles as cloud condensation nuclei (CCN) and its relation to other properties of aerosols from different sources and regions are, however, not yet well characterized. CCN are those particles onto which water vapor condenses to form cloud droplets at a given water vapor supersaturation.

During the Cloud and Aerosol Characterization Experiment (CLACE 6) in February-March 2007, we measured CCN concentrations and efficiencies using a continuous-flow CCN counter (CCNC, DMT), differential mobility analyzer (DMA, TSI), and a condensation particle counter (CPC, TSI).

Size-resolved CCN concentrations and effiencies (monodisperse aerosol) and total CCN concentrations (polydisperse aerosol) were recorded alternatingly in the particle size range of 20-250 nm and at water vapor supersaturations of 0.1-0.7 %. The instruments were connected to the total aerosol inlet. The basic processing and quality control of the measurement data have been completed successfully.

Detailed analysis and interpretation of the results in combination with complementary physical and chemical aerosol parameters measured by the CLACE campaign partners are under way and expected to provide substantial new insight into the formation of clouds and the influence of aerosols on climate.

Key words:

cloud condensation nuclei (CCN), droplet activation, water vapor supersaturation

Collaborating partners/networks:

Paul Scherrer Instut, Villigen, Switzerland; Max Planck Institute for Chemistry, Particle Chemistry Department; DFG-SFB 641 TROPEIS; CLACE 6 Team

Scientific publications and public outreach 2007:

Refereed journal article

D. Rose, G. P. Frank, U. Dusek, S. S. Gunthe M. O. Andreae, and U. Pöschl. Calibration and measurement uncertainties of a continuous-flow cloud condensation nuclei counter (DMT-CCNC): CCN activation of ammonium sulfate and sodium chloride aerosol particles in theory and experiment. Atmos Chem Phys Discuss, 7, 8193-8260, 2007.

Conference papers

D. Rose, S. S. Gunthe, E. Mikhailov, G. P. Frank, U. Dusek, M. O. Andreae, and U. Pöschl. Calibration and measurement uncertainties of a continuous-flow cloud

condensation nuclei counter (DMT-CCNC): CCN activation of ammonium sulfate and sodium chloride aerosol particles in theory and experiment. Geophys Res Abstr, 10, 07860, 2008.

S. Gunthe, D. Rose, E. Mikhailov, P. Reutter, J. Trentmann, M. Simmel, M. O. Andreae, and U. Pöschl. Activation of aerosol particles with complex chemical composition as cloud condensation nuclei (CCN) in laboratory experiments, field measurements and model simulations. Geophys Res Abstr, 10, 09558, 2008.

D. Rose, G.P. Frank, U. Dusek, M.O. Andreae, and U. Pöschl. Are the cloud condensation nuclei (CCN) properties in polluted air different from those in a remote region? Geophys Res Abstr, 9, 09452, 2007.

D. Rose, G.P. Frank, U. Dusek, M. Gysel, E, Weingartner, S. Walter, J. Curtius, and U. Pöschl. Cloud condensation nuclei (CCN) concentrations and efficiencies on Jungfraujoch during the CLACE-5 campaign. Geophys Res Abstr, 9, 09627, 2007.

D. Rose, G.P. Frank, U. Dusek, M.O. Andreae, and U. Pöschl. Are the cloud condensation nuclei (CCN) properties in polluted air different from those in a remote region? European Aersol Conference, Salzburg, 2007.

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