



Diagnostic Tools for the Characterisation of Ice Clouds: Instrumentation of the Aerosol and Cloud Chamber AIDA

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Studies on the formation of ice clouds by homogeneous and heterogeneous nucleation have become a focus of the research activities at the AIDA aerosol and cloud chamber of Forschungszentrum Karlsruhe (Aerosol Interactions and Dynamics in the Atmosphere). Due to permanent improvements since its initial operation in 1997, the AIDA instrumentation today features excellent diagnostic techniques for comprehensive studies of the formation and growth of ice crystals in expansion cooling experiments. Thereby, cloud microphysical processes can now be analysed in a quantitative manner, as e.g. recently demonstrated by measuring T-dependent homogeneous ice nucleation rates in supercooled cloud droplets.

In this presentation, we want to review our experimental techniques for the characterisation of ice clouds, including: counting and sizing of ice crystals with optical particle counters; direct imaging of ice crystals by a CCD camera with microscope optics; measurement of light scattering by ice crystals in forward and backward direction (polarization-resolved); collection of ice crystals using a counterflow virtual impactor with subsequent analysis of ice cloud residuals; retrieval of the size distribution of the ice crystals from broadband infrared extinction spectra; accurate measurement of the interstitial water vapour pressure in the presence of an ice cloud using near-infrared tuneable diode laser absorption spectroscopy.

The application and interplay of the various techniques will be briefly demonstrated on the basis of selected ice nucleation experiments using the AIDA aerosol vessel as cloud expansion chamber. In addition to the instruments permanently installed at the AIDA chamber, we will highlight recent collaborations with external partners,

contributing their own equipment to the AIDA instrumentation during measurement campaigns on ice nucleation.