



Single-Particle-Soot-Photometer (SP2) investigations of soot aerosol and cloud interactions

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In preparation for aircraft based measurements, two Single-Particle-Soot-Photometers (SP2) have been successfully applied in a series of measurement campaigns at the cloud simulation chamber AIDA at the Karlsruhe Institute of Technology. The instruments operated by the Max-Planck-Institute for Chemistry Mainz and the German Aerospace Center (DLR) in Oberpfaffenhofen are planned to be used onboard the new German High Altitude and Long Range Research Aircraft (HALO). During the HALO field mission ACRIDICON (Aerosol, Cloud Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems) both instruments shall be operated simultaneously sampling from two different types of inlets. Continuous measurements behind a sub-micrometer particle inlet and a counterflow virtual impactor (CVI) will provide crucial insights into the interaction of soot aerosol with clouds under ambient conditions.

In this paper, we present SP2 data from three consecutive measurement campaigns at the cloud simulation chamber AIDA: Aerosol Cloud Interactions 02 (ACI02 2008), Aerosol Cloud Interactions 03 (ACI03 2009), and SOOT11 (2010). The SP2 instruments have been characterized for a wide range of temperatures and pressures, and a series of cloud expansion experiments have been conducted for different types of soot, organic and inorganic coatings, mixtures with mineral dust. Using a pumped counterflow virtual impactor (PCVI), it was possible to simulate aircraft sampling conditions during the formation of a cloud. The chamber study results increase our ability to understand and utilize future aircraft data.

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