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Mass spectrometric airborne measurements of submicron aerosol and cloud residual composition in tropic deep convection during ACRIDICON-CHUVA

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Airborne measurements of submicron aerosol and cloud particles were conducted in the region of Manaus (Amazonas, Brazil) during the ACRIDICON-CHUVA campaign in September 2014. ACRIDICON-CHUVA aimed at the investigation of convective cloud systems in order to get a better understanding and quantification of aerosol-cloud-interactions and radiative effects of convective clouds. For that, data from airborne measurements within convective cloud systems are combined with satellite and ground-based data.
We used a C-ToF-AMS (Compact-Time-of-Flight-Aerosol-Mass-Spectrometer) to obtain information on aerosol composition and vertical profiles of different aerosol species, like organics, sulphate, nitrate, ammonium and chloride. The instrument was operated behind two different inlets: The HASI (HALO Aerosol Submicrometer Inlet) samples aerosol particles, whereas the CVI (Counterflow Virtual Impactor) samples cloud droplets and ice particles during in-cloud measurements, such that cloud residual particles can be analyzed. Differences in aerosol composition inside and outside of clouds and cloud properties over forested or deforested region were investigated. Additionally, the in- and outflow of convective clouds was sampled on dedicated cloud missions in order to study the evolution of the clouds and the processing of aerosol particles.
First results show high organic aerosol mass concentrations (typically 15 μg/m^3 and during one flight up to 25 μg/m^3). Although high amounts of organic aerosol in tropic air over rainforest regions were expected, such high mass concentrations were not anticipated. Next to that, high sulphate aerosol mass concentrations (about 4 μg/m^3) were measured at low altitudes (up to 5 km). During some flights organic and nitrate aerosol was observed with higher mass concentrations at high altitudes (10-12 km) than at lower altitudes, indicating redistribution of boundary layer particles by convection. The cloud residuals measured during in-cloud sampling through the CVI contained mainly organic material and, to a lesser extent, nitrate.