Hill Cap Cloud Thuringia 2010 (HCCT-2010): Overview and highlight results

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Clouds have a strong impact on physical and chemical processes in the atmosphere. Studying the interaction of aerosol and clouds under natural conditions is challenging, due to the height, as well as the spatial and temporal variability of clouds. Lagrangian-type field experiments, where a hill cap cloud is used as a natural flow-through reactor were successfully performed in the past to investigate different aspects of physical and chemical aerosol cloud interaction [*Bower et al.*, 2000; *Fuzzi, 1994; Fuzzi, 1997; Gallagher, 1999*; *Herrmann*, 2005].

In September/October 2010, the international cloud experiment "Hill Cap Cloud Thuringia 2010" (HCCT-2010) was performed at the Schmücke, which is part of a large mountain ridge in Thuringia, Germany. HCCT-2010 aimed at a better understanding of (i) the chemistry and microphysics within a cloud, (ii) chemical and physical modifications of aerosol particles by their passage through a cloud, (iii) the effects of clouds on the phase partitioning of oxygenated volatile organic compounds (OVOCs), and (iv) the effects of clouds on the budget of the main radical oxidants OH and HO_2.

In Figure 1 a scheme of the campaign area is given.

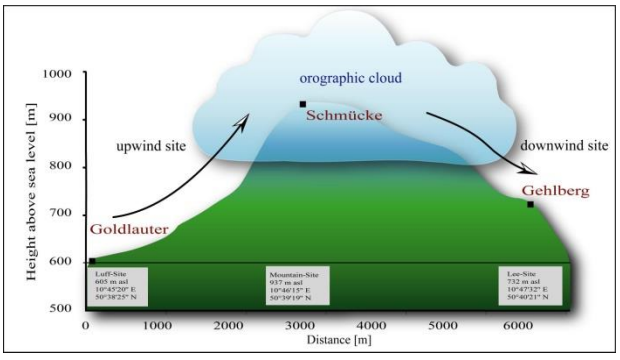

Figure 1: Scheme of the campaign area and the 3 sites.

Three measurement sites were set up: An upwind site to comprehensively characterize incoming air masses, an in-cloud site on the Schmücke summit to sample the different phases of a cloud, and a downwind site to study possible modifications of the aerosol after the cloud passage.

An extended pool of instruments was installed at the sites, including gas monitors, VOC and OVOC samplers, FAGE, SMPS, APS, HTDMA, CCNC, MAAP, CPC, filter samplers, impactors, MARGA, PILS, AMS, ALABAMA, a ceilometer, bulk and multi-stage cloud water collectors, CVI and interstitial inlet, PSAP, PVM, and FSSP.

A total of 370 hours of clouds could be captured at the summit station during the six weeks duration of the campaign. Certain offline samplers were operated only when meteorological observations predicted favourable flow connectivity between the sites, which was the case for a total of 73 hours during 12 so-called "full cloud events". A thorough investigation of meteorological conditions results from statistical analyses and several SF_6 tracer experiments revealed several top events, where a good flow connectivity between the three sampling sites can be assumed.

The study of physical and chemical parameters within these air masses led to interesting findings in scientific areas such as aerosol processing through clouds, chemical cloud composition, or the influence of clouds on the radical oxidants budget.

Within this contribution, an overview over the campaign will be given and some of the results will be highlighted.

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