

Cloud chemistry during HCCT-2010: Water soluble organic carbon

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In September/October 2010 the ground-based cloud experiment “Hill Cap Cloud Thuringia 2010” took place at Mount Schmücke in the Thuringian Forest, Germany. The chemical composition of clouds was studied by means of different sampling and analytical techniques. Four Caltech Active Strand Cloud Water Collectors (CASCC2, [Demoz *et al.*, 1996]) were applied to sample large volumes (up to 640 ml) of bulk cloud water with a 50 percent droplet size cut (D_{50}) of 3.5 μm and a one hour time resolution. Additionally, two multistage versions of the CASCC were used. A 3-stage collector [Raja *et al.*, 2008] with D_{50} of 22, 16, and 4 μm diameter for stages 1, 2, and 3, respectively, and a 5 stage collector [Moore *et al.*, 2002] with D_{50} of 30, 25, 15, 10, and 4 μm for stages 1 to 5. Due to the lower amounts of cloud water available in the different droplet size classes, the multistage collectors usually sampled 2-hourly (3-stage) and 4-hourly (5-stage) cloud water samples. All cloud water collectors were installed on top of a 20 m high tower.

To complement the liquid cloud water samples, droplet residuals and interstitial particles were sampled downstream of a counterflow virtual impactor (CVI) and an interstitial inlet [Mertes *et al.*, 2005] using filters and an aerosol mass spectrometer (AMS).

Water soluble organic carbon (WSOC) was measured as non-purgable organic carbon (NPOC) with a commercial TOC analyser (Shimadzu TOC-V) after filtration of the samples through 0.45 μm syringe filters. The samples were stored frozen in pre-cleaned plastic bottles until analysis.

As can be seen in Figure 1, the bulk water concentrations of WSOC were between 1.2 and 34 mgC l^{-1} with an average concentration of 6.2 mgC l^{-1} . From the size-resolved sampling with the 3-stage CASCC (Figure 2) it can be observed, that the smallest droplets (stage 3) typically have higher concentrations than the larger ones (stages 1 and 2).

The cloud water concentration data will be discussed with regards to cloud microphysical parameters (liquid water content, droplet size spectrum), meteorology, and air mass origin. Additionally, a comparison of WSOC concentrations from cloud water and CVI filters will be given, as well as the fraction of organics measured by the AMS behind the CVI that can be explained by WSOC.

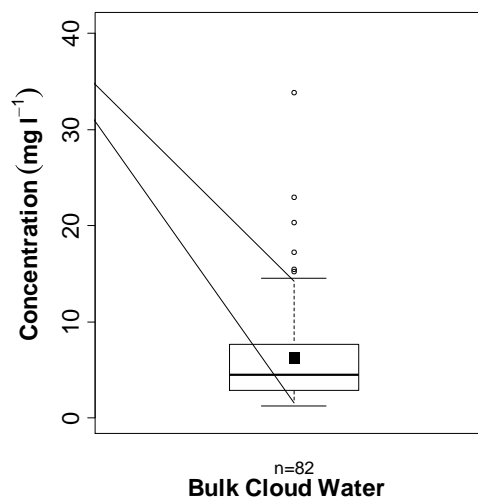


Figure 1: Bulk concentrations of WSOC in mg l^{-1} .

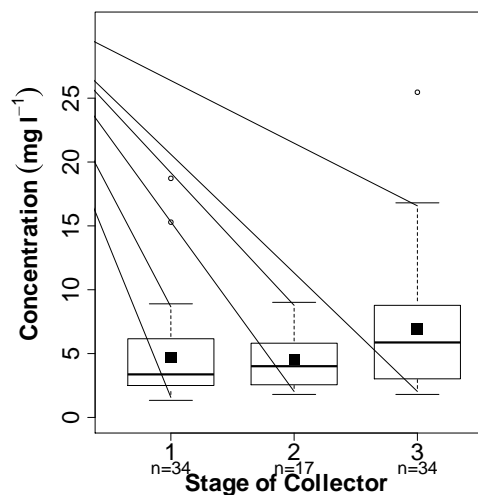


Figure 2: Size resolved concentrations of WSOC from 3-stage collector.

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