Cloud condensation nuclei concentrations and actual supersaturations in real clouds

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The number of cloud condensation nuclei (CCN) at a given supersaturation has an important influence on cloud properties and is therefore crucial for a better quantification of the indirect aerosol effect on climate. Only in recent years, CCN data have become available from different sites in a systematic manner. We have measured the CCN number concentration continuously at the high alpine site Jungfraujoch (3580 m asl) continuoulsy for several years, in the framework of the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization [1], and perfomed a closure with other aerosol variables measured simultaneously at the same site [2]. We show that the critical dry diameter, above which the aerosols activate as CCN, does not show a distinct seasonal cycle, nor substantial variability, indicating that aerosol hygroscopicity stays fairly stable throughout the year. Therefore, the CCN number concentration at this site can be reliably predicted from the time-resolved particle number size distributions with approximate knowledge of the time averaged chemical composition.

Since the Jungfraujoch is within clouds about 40% of the time this site provides the possibility to compare the measured CCN number concentrations with the activation that occurs in the real clouds. For this purpose, two different inlets were used: A total inlet, heated to 25°C was used to evaporate cloud droplets and ice crystals and to sample both their residual (previously activated and/or nucleated) particles and the interstitial (non-activated) particles. A second, interstitial inlet was equipped with a cyclone to remove cloud particles and sample only the non-activated aerosol particles (smaller than 2 μm). A comparison of the size distributions behind these two inlets allows to retrieve the activation diameter in the real cloud [3]. Together with the measured CCN spectra this provides the maximum supersaturation the cloud experienced in the vicinity of the Jungfraujoch.

[1] Jurányi *et al*. (2011) *J. Geophys. Res*. 115, doi:10.1029/2010JD015199. [2] Jurányi *et al*. (2010) *Atmos. Chem. Phys*. **10**, 7891-7906. [3] Verheggen *et al*. (2007) *J. Geophys. Res*. **112**, D23202, doi:10.1029/2007/JD008714.

An animal model (sheep) for Fe, Cu and Zn isotopes cycling in the body

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Iron, copper and zinc are three essential metals for life. The concentration of these metals is regulated by the metabolism to reach body requirements, but almost nothing is known about the variations of the stable isotopes in the body. This could bring new insights on the metabolism of the metals, but the mapping of the isotopic variability in normal conditions is necessary prior to any applications for the study of metal metabolic disorders. Here, we report Fe and Cu isotope compositions (δ^{56}Fe and δ^{65}Cu) and concentrations in various organs of sheep raised experimentally with constant diet (δ^{56}Fe and δ^{65}Cu ≈ 0‰). Iron isotope compositions range from about -4‰ to -1‰ (muscle and liver/kidney, respectively), and copper isotope compositions range from -1.5‰ to +1.5‰ (liver and kidney, respectively), therefore covering almost the geological variability. The variability of the Fe and Cu isotope compositions is higher than for Zn (-0.6‰ to +0.6‰, [1]), suggesting that biologically-induced metals isotope fractionations depend more on redox conditions than on ligand coordination. Contrary to humans [2], the Fe and Cu isotope compositions are similar in serum and red blood cells. The isotopic cycling of the metals in the body is discussed using mixing equations and box modeling.

[1] Balter *et al*. (2010) *Rapid Comm. Mass Spectrom*. **24**, 605-612. [2] Albarède *et al*. (Submitted) *Metallomics*