$\delta^{13}C$ of carbon dioxide in ancient air from ice core samples

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The concentration and stable carbon isotope composition ($\delta^{13}CO_2$) of carbon dioxide (CO_2) trapped in ancient ice are essential for the reconstruction of the paleo record of greenhouse gases, the study of the global carbon cycle, and the prediction of the future climatic evolution.

At present, high-resolution ice core $\delta^{13}CO_2$ data for larger time spans are scarce. New analytical methods are being developed with the objective to increase the time resolution (smaller sample size), to improve the accuracy of the measurements, and, particularly in clathrate ice, to optimize the extraction efficiency. The recent analytical improvements include different continuous flow setups (LGGE, University of Bern) and off-line extraction by sublimation (AWI). Thus obtained higher sensitivity to changes in the $\delta^{13}CO_2$ record is important in view of the small variations of few tens of a per mill observed in previous studies.

The ongoing measurements are performed primarily on ice from two Antarctic drilling sites, the EPICA Dome Concordia (EDC) and Dronning Maud Land (EDML). We will present the status of $\delta^{13}CO_2$ and associated CO_2 concentrations data from ice cores with a focus on the Holocene and the recent glacial–interglacial transitions, and discuss the available constraints that they provide on the global carbon system and its past variations.