The Terminations 1 and 2 as revealed by the record of stable isotopes from the EDML ice core

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The data

Within the European Project for Ice Coring in Antarctica (EPICA) two deep ice cores were recovered. The second one (labelled EDML, total depth 2774m) was drilled in Dronning Maud Land (DML) in the Atlantic sector of Antarctica [1]. It is well dated down to the depth of 2416m with an age of 150 kyrs BP [2]. Stable isotopes (^{18}O, D) have been measured with depth resolutions of 0.5m and 0.05m, and the deuterium excess values were calculated [3]. The stable isotope records for terminations 1 and 2 (T1, T2) were resampled on common time steps of 50 years. Corrections to the ^{18}O and D values had to be added to account for surface elevation changes and changing ^{18}O content of the sea water in the past.

Discussion

The most prominent difference between T1 and T2 is that the Antarctic Cold Reversal (ACR) of T1 has no analogue in T2. With the elevation corrections used in [1| T2 shows a steady increase from -51.5 ‰ to -40 ‰ over a time span of 9 kyrs, whereas T1 displays an increase from -52.5 ‰ to -44 ‰ over 8 kyrs. The influence of the elevation corrections will be discussed, which increase δ^{18}O during MIS5.5 and lower it during the glacials. The deuterium excess shows differences towards the end of the terminations, with lower values in and after the ACR during T1. The main driver of these differences lie in the conditions prevailing in the evaporative source areas and of the subsequent transport of the moisture providing snow at the site. We infer that the atmospheric transport and the source area of precipitation or the source temperature were different for T1 and T2.

[1] EPICA community members (2006) *Nature* **444**, 195-198. [2] Ruth *et al.* (2007) *Clim. Past* **3**, 475-484. [3] Stenni *et al.* *Quatern. Sci. Rev.*, subm.

The passivation of calcite during the treatment of acid mine drainage. Laboratory experiments

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Column experiments simulating the behavior of passive treatment systems for acid mine drainage have been performed. Synthetic acid solutions (H_2SO_4) containing Fe(III) (400-1500 ppm, pH 2) or Al (100-1000 ppm, pH 2-3) were injected into column reactors packed with calcite grains. Grain size was between 1 and 2 mm and flow rates ($6x10^{-7}$ - 10^{-6} m/s) were kept constant during the experiments. Aragonite and dolomite were also tested. The columns worked as an efficient barrier for some time, increasing the pH of the circulating solutions to ~7 and removing its metal content. Previous results [1] had already shown that gypsum precipitation coated the carbonate grains and led to the passivation of the system, while metal-oxydydroxysulfates precipitated towards the center of the pores.

For the Fe(III) system, passivation time decreases with increasing input Fe(III)-SO_4 concentrations, until a minimum asymptotic value is reached. Total Fe(III) retained increases with input concentration when this asymptotic value is reached. Slower flow rates seem to cause an increase in both passivation time and total Fe(III) retained.

For the Al system, passivation time also tends to decrease with larger Al-SO_4 concentrations. Total Al retained also tends to decrease with increasing input concentrations.

Some of the column experiments have been analyzed at regular intervals using synchrotron X-ray microtomography at the ALS (Berkeley, USA). The evolution of pore structure and secondary mineral precipitation (goethite, schwertmannite, gibbsite) at the microscopic scale has been investigated. Mineralogical analyses (synchrotron X-ray microdiffraction) were also performed. The results show the advance of the reaction fronts along the columns, with the formation of the gypsum coatings on the limestone grains and precipitation of metal-oxydydroxysulfates between the grains. The formation of prefrential flow paths in the porous medium has also been observed.

[1] Soler *et al.* (2008) *Appl. Geochem.* **23**, 3579-3588.