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 had been recovered, at Dome C and Kohlen Station, respectively (Figure 1). The second core was drilled in Dronning Maud Land (EDML). In the Atlantic sector of Antarctica, at Kohlen Station (0.838° S, 76.035° E, 2882 m WGS84), 2, 3, 4, 5 it was labelled EDML. In total, the recovered core is 2774 m long. The annual accumulation rate at the drill site amounts 64 kg m⁻² a⁻¹. The horizontal flow velocity is 0.74 m/a [3]. The EDML core is well dated to the depth of 3418 m with an age of 180 kyr BP [6].

Stable isotopes (δ18O, δD) have been measured with a depth resolution of 0.5 m and 0.05 m, respectively. The shown data correspond to the published data with the gradient -0.94 ‰/100m [3]. In addition, a thinner black line shows the 0.5 m samples corrected with the smallest gradient of -0.63 ‰/100m to indicate the uncertainty due to different spatial gradients.

The stable isotope records for the periods of terminations 1 and 2 (T1, T2) were resampled on a common time step of 50 years [8]. The record for Termination 1, red colour in Figure 3, is only based on 0.5 m samples. The record for Termination 2 is plotted with the 0.5 m samples (blue colour) and the 0.05 m samples (pink colour), as far as data are available, to get a similar time resolution for both terminations. The measured data span the last 200,000 years. The deuterium excess records of EPICA Dome C and Dronning Maud Land ice cores (East Antarctica, Antarctica. Nature 444, 195-198.) have been compared with the data of EPICA Dome C and Dronning Maud Land ice cores (East Antarctica. Quatern. Sci. Rev., Special issue, subm.).

Discussion

The most prominent difference between T1 and T2 is the fact that the Antarctic Cold Reversal (ACR) of T1 has no analogue in T2. This is a common feature with the EDC ice core [7]. With the elevation correction of -94 ‰/100m used in [3] T2 shows a steady increase from -51.5 ‰ to -40.5 ‰ over a time span of 9.5 kyr, whereas T1 displays an increase from -52 ‰ to -44 ‰ over 8 kyr. At the beginning of the Terminations the gradient of the increasing 18-O content is almost similar for 3 kyeares, until the ACR during T1. The influence of a smaller elevation gradient than used in [3] does not strongly affect T1. For T2, however, a smaller gradient would lower the 18-O values, and thus make the difference between T1 and T2 as well as between the Holocene and MIS 5.5 smaller. The deuterium excess shows differences towards the end of the terminations, with remarkable lower values in and after the ACR during T1. The main driver of these differences lies 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 the moisture providing snow at the site. We infer that the atmospheric transport and the source area of the subsequent transport.