Cosmogenic ^{10}Be as a high resolution correlation tool for climate records

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Precise correlation of climate records is of critical importance for the themes of the present symposium. Because the controlling parameters (solar activity, geomagnetic field intensity, primary cosmic ray intensity) act globally and synchronously, identification and matching of distinctive features in cosmogenic isotope production rates in the climate records is one way of making such correlations. One of the most dramatic and reliably identified of these production variations is the enhanced production occurring ~40,000 years ago, first discovered in the Vostok ice core. This ^{10}Be "peak" was subsequently detected in other Antarctic and Greenland ice cores, and tentatively identified in several sediment cores. We report here a new high resolution profile of the ^{10}Be peak measured in the recently recovered EPICA ice core from Dome C Antarctica, together with a δ^2H profile in the same core. We then discuss the implications regarding the relative phasing of northern hemisphere vs southern hemisphere climate records during the last glacial period.

The ^{10}Be measurements were made at 11 cm (~9 year) resolution but are plotted as a 5 point running mean. The peak is centred at 740 m, almost 100 m less than in an earlier core at Dome C. As we already observed in similar high resolution measurements in a Vostok core, the peak shows structure even on decadal time scales. This enhances its potential for high resolution correlation. The δ^2H profile, made at 55 cm resolution, has 4 features that, based on their position and pattern, we identify as subdued analogues of interstadial (Dansgaard-Oeschger) events 8-11 observed in Greenland. The ^{10}Be peak straddles event 10, exactly as seen in the GRIP core. This implies that, within our ability to resolve, which we presently estimate as 200 years, the GRIP and EPICA climate records at this time are synchronous. This is in contradiction with conclusions based on methane records, which show Vostok climate leading Greenland by >2000 years in this period. If our analysis is correct, it implies either that there is a significant error in the modelled methane-ice age differences at Vostok, or that the phase relationship between the East Antarctica and Greenland climate records changes with time.