

Interactive comment on “Direct North-South synchronization of abrupt climate change recording in ice cores using beryllium 10” by G. M. Raisbeck et al.

G. M. Raisbeck et al.

Received and published: 30 July 2007

Replies are in bold

This paper makes use of the fact that production changes of cosmogenic radionuclides such as ^{10}Be are a global phenomenon and can therefore be used to synchronize Greenlandic and Antarctic ice cores provided the production signal is stored in an undisturbed way in the ice. The most prominent production feature is the peak around 40'000 cal y BP which is due to the very low geomagnetic dipole field (Laschamp excursion) which lasted more than 1000 years. Superimposed on the geomagnetic signal are short-term variations due to solar variability. A precise synchronization of the hemispheres is crucial to test the bipolar seesaw hypothesis which assumes that Greenland

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and Antarctica are warm and cool in anti-phase as a result of the THC. By matching the ^{10}Be flux from EDC (Antarctica) with the ^{10}Be in the GRIP core from Greenland the authors show for 3 out of 4 AIM's a good agreement within the seesaw model. Overall, the paper is convincing. However, there some issues which should be improved before publication:

Matching procedure: Although the synchronization of two ^{10}Be records is central in this paper no more is said than “the best match is shown in Fig. 2”. Which criteria were used to decide which match is the best? In fact, visual inspection of Fig. 2 suggests that shifting the peak in the EDC core at 43.5 ky to 44.3 ky would not only improve the match but also fix the mismatch between AIM 11 and the seesaw model curve. There are obvious gaps in the ^{10}Be concentration records. How were these gaps considered? No conclusions are drawn regarding the effect of the matching on the presently used time scales. A short discussion and a table providing some tie points would be very useful for the reader.

As described in the text, the matching procedure outside the peak region has now been modified, resulting in a shift around 44 ky in the direction suggested by the reviewer. This does indeed improve the agreement with the model at AIM 11. Gaps in the data were interpolated. A table with the tie points used has been added.

Minor points: P 757, L 5/6: The position of a peak in the ice is independent of climate, but not necessarily its form. This may affect the matching.

Correct. We try to minimize this problem by using fluxes rather than concentrations, and matching mainly phasing rather than amplitudes.

P 758, L 25: why with a ^{10}Be record from Greenland? Is it not the GRIP record?

Changed

P 759, L 7: A reference to the previous procedure is missing here. This chapter could

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be slightly shortened by just pointing out the main steps that were modified

References have been added. The description is essentially those steps that were modified.

P 759, L 25: periods of low and high solar activity

Changed to periods of variable solar activity

P 760, L 24: The events A1 and A2 should be indicated in Fig. 2

Done

P 761, L 26: with observed variations

We now specify that it is mainly observed phase variations

P 762 Perspectives: temporal resolution is just one aspect of matching. A somewhat broader discussion of the uncertainties would be interesting but is not absolutely necessary.

Rewritten

P 763, L 7: markers in polar

Corrected

P 763, L 10: "Bender" instead of ".Bender"

Corrected

P 766, L 1: Roethlisberger, R.

Corrected

p 767: Fig. 1 AIM not ATM, indicate A1 and A2 in the figure

Done

Interactive comment on Clim. Past Discuss., 3, 755, 2007.

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3, S497–S500, 2007

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