

Interactive comment on ““EDML1”: a chronology for the EPICA deep ice core from Dronning Maud Land, Antarctica, over the last 150 000 years” by U. Ruth et al.

U. Ruth et al.

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Anonymous Referee 1 Received and published: 28 April 2007

Authors' response (bold face)

The paper presents a new 150 kyr chronology (EDML1) for the EDML ice core based on the most recent EDC time scale (EDC3). The two ice cores are synchronized by various types of match points and EDC3 is transferred to EDML using this synchronization. To complicate matters, the most recent 41 kyr of EDC3 are actually adapted from Greenland ice core chronologies which are transferred to EDML by use of interhemispheric match points and then carried on to EDC via the EDML-EDC synchronization. The paper attempts to evaluate how closely the EDML1 and EDC3 time scales are

linked, i.e. to estimate the uncertainty introduced in the time scale due to the transfer from EDC to EDML.

The work is of high quality and thoroughly prepared, it is relevant for CP, the manuscript is well written and it can be published with minor corrections.

GENERAL COMMENTS:

Because of the many data sets involved in the construction and transfer of the time scale it is not always obvious which data are actually presented for the first time in this paper and what is presented in accompanying papers. The construction of the EDC3 time scale is described in a separate paper (Parenin et al., submitted). Many of the EDC-EDML volcanic match points are presented in a paper by Severi et al., submitted, and others in a paper by Traufetter et al., 2004.

If I read the paper correctly the following items are uniquely presented in this paper:
- The B32/EDML/EDC volcanic match points of the last 2000 yr (shared with Severi et al.) - The Holocene 10Be match between EDML and GRIP - The Holocene 10Be-14C match between EDML and INTCAL04 - The EDML-NGRIP methane match in the glacial termination - Most of the EDC-EDML volcanic match points in the 52-128.3 kyr range - The non-volcanic EDC-EDML match points (dust + isotopes) in the 128.3-150 kyr range - The uncertainty estimate of the EDML1 time scale caused by the transfer from EDC - Comparison to other time scales in the Holocene

If this list is incorrect the manuscript should be adjusted to clarify for the reader which reference to make to which item.

Your list is correct.

The Holocene EDML-GRIP 10Be matching appears to be somewhat weakly documented in the manuscript. Is there a reference to this comparison or can it be included as a Figure?

Supplementary Fig. S2 has been moved to the main text to emphasize

this part. The text has been reworked to make the explanation easier to follow.

The same holds for the EDML-Greenland methane matching in the last termination that appears not to be documented in Figures or references?

A reference to Blunier et al. (this issue) has been included.

It is mentioned that the differentiated depth-depth relationship between EDML and EDC has been checked. What does it look like? Since the volcanic matching of EDML and EDC really is the back bone of this work, I think it makes good sense to show what the matching looks like in full detail. Figure 2B gives a hint, but the diff. d-d relationship would probably provide more information.

Discussion of this topic is reserved for Severi et al. (this issue).

SPECIFIC COMMENTS:

p. 552, l. 3.: The 0-8 kyr section of the GICC05 time scale is presented in a paper by Vinther et al., 2006. If used it should be referenced (see below).

Reference to Vinther et al has been included.

p. 554, l. 16-19.: Brackets around 'Clausen et al., 1997' and 'Traversi et al.'

to be checked during copy-editing

p. 555, l. 3.: What is the significance of the sentence 'for these cores from interior East Antarctic sites'? Do those signals differ elsewhere?

unclear part of this sentence has been removed

P. 556, l. 25.: At the depth resolution applied in Fig S1, the match points B, C and D are not convincing. Does it look more convincing in higher resolution?

Match B is well-constrained within the error given. The precise assignment of match C is disputable, but it has a large error assignment. Match

D is already in the region acknowledged ‘uncertain’. The matches C and D appear better constrained when the depth scale is extended downwards, but this would compromise the rest of the figure. We agree that the matches are not great. That’s why we let EDML1 end at 150 ka BP and give large errors for the bottom part.

p. 559, l. 3.: ‘will be’ -> ‘is’.

done

p. 560, l. 15.: ‘The differentiated depth-depth relationship has been checked...’ - see general comment above.

see answer above

p. 564, l. 17.: ‘Results from numerical experiments with a 3-D model...’ Do these experiments make part of the present work? If so, some more details should be given. If not, a reference should be given.

A reference to Hybrechts et al. (this issue) has been included to reference the model used. However, the results discussed on p. 564 are not documented in the reference but are part of the present work. Further details are not given because these results are not the main focus of our paper.

Table 1: Excess decimal point: ‘2.4-52 kaBP’

corrected

Fig. 2 caption: ‘uncorrected true depth’ meaning no firn compression correction applied?

wording improved

Fig. 5: The 160 yr EDML1-GICC05 mismatch looks rather suspicious and it seems ‘glaciologically inconsistent’. Again, is the Holocene EDML-GRIP 10Be match available

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somewhere or will it be?

The mismatch falls within a time of only small variations of ^{10}Be (or ^{14}C) production rates and therefore may possibly not be fully robust. Note that the two control points were set outside this time.

Supplementary material 'table-sp4.xls' seems that the last rows should be removed (below row 2446)

done

REFERENCE:

Vinther, B.M., H.B. Clausen, S.J. Johnsen, S.O. Rasmussen, K.K. Andersen, S.L. Buchardt, D. Dahl-Jensen, I.K. Seierstad, M.-L. Siggaard-Andersen, J.P. Steffensen, A.M. Svensson, J. Olsen, and J. Heinemeier, A synchronized dating of three Greenland ice cores throughout the Holocene, *Journal of Geophysical Research*, 111, D13102, doi:10.1029/2005JD006921, 2006.

We thank the reviewer for the thorough and constructive review!

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