Clim. Past Discuss., 3, S275–S280, 2007
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Climate of the Past Discussions

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.

Anonymous Referee #2

Received and published: 7 May 2007

This paper describes the development of a chronology for the DML ice core. The Dome C chronology (which is based on a 1D ice flow model) is used as the basis of the new chronology, with stratigraphy (primarily volcanic fallout events over the past 128 ka) used to tie the two, i.e. to determine the age scale. Back to 41 ka BP, a link to the Greenland ice core chronology is also made through 10Be and methane. Beyond 150 ka BP, the fit is ambiguous, possibly, it is suggested, due to the unknown rate of basal melting caused by elevated geothermal heat flux.

An understanding of the chronology of the DML ice core is critical to the interpretation of the core for climate studies. New data are presented and analyzed in a novel way,

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Discussion Paper

clearly explained and scientifically valid. The results support the conclusions, in my opinion with one small exception - there is very little evidence provided to support the assertion in the conclusions (but not mentioned elsewhere in the text) that geothermal heat flux variations may be responsible for the basal melt. The description of the work, reference to other appropriate material, presentation, supplementary material, etc. are all satisfactory or better.

This important paper should be published.

Some specific comments as I read through the manuscript follow, that I ask the authors to consider.

Page 540

Title should be changed to read "..over the past 150 000 years". It is somewhat pessimistic to suggest that the past 150 000 years were in fact the last 150 000 years.

Page 550

Abstract

line 10: here and throughout the text, it seems to me that if the word 'age' is used, then 'BP' should not be used. The word 'age' implies BP. So "For ages younger than 41 ka .." or "At times less than 41 ka BP ..".

line 10: before 'EDML1/EDC3' (which does not need to be in italics), add "The new synchronized time scale,"

line 11: before 'GICC05' add "ice core chronology,"

line 13: I hope it is not the last 60 ka, but rather, the past 60 ka.

line 16: "hint at a complex"

line 17: Given that geothermal heat flux is not mentioned throughout the paper until the last paragraph of the conclusions (see later), I don't think it warrants a mention in

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the abstract. It is not a critical finding of this paper.

Introduction

first 4 lines: a couple of references as examples would be good, to interpretation, to cyclicity, and to phasing at different sites.

line 24: I would have thought point 1 might be (i) identification of different annual layer indicators

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line 7: change “would be” to “is”

line 11: “far reaching” in which sense? Back in time ?

line 17-18: the Parrenin paper is in this volume. Is this the special issue referred to on the next line?

Line 24: “counting leads to ... counting errors.” - re-word.

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line 1: I found the tense used several times in (throughout) the paper, somewhat difficult. Sometimes the past tense is used (e.g. “was”), sometimes the past participle is used (e.g. “has been”). Often in my opinion, the present tense is better. Here is an example “For the Holocene section it is therefore preferable to transfer the well-established ...” This would always be the case; not just when the authors did it. I will not comment further on this, but I do think the authors should consider this - it affects the readability of the paper.

The argument from line 6 to line 26: The 1D EDC flow model is used for dating the EDML ice core. This is done because the complexity of the 3D model for EDML renders it impractical. However, it is stated earlier in the paragraph that for EDML, a 1D ice flow model CANNOT be employed to find a REALISTIC chronology, and that a 3D model is

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NECESSARY. While I suspect the logic of the science here is OK, (you use the EDC model as a substitute - as a proxy), I think some of the adjectives may need softening, e.g. “cannot” to “is best not”, “necessary” to “desirable”.

line 6: “very gently slope” . You mean the slope is low. A slope cannot be gentle, just as a temperature cannot be colder, and an elevation cannot be higher. Can you provide an actual value for the slope?

line 10: “.. upstream of the drill site at higher elevation ..” - of course !

line 15-16: change to “... at present the surface is 240 m higher than at EDML and based on ...” i.e. delete “elevation: and add “than at EDML”.

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line 2: How were the selected dating constraints from EDML transferred to EDC

line 7: you see that you define dates (not ages) as a BP.

2. EDML-EDC stratigraphic link

line 11: so the EDML1/EDC date is 128.3 ka BP (or its age is 128.3 ka).

line 23: 73 cm would seem to me quite a large off-set.

Page 554

line 16: brackets around Clausen et al., 1997

line 19: brackets around Traversi et al., 1997

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line 14-15: replace “others but also these provide” with “others but they do also provide”

line 19: delete “a”, i.e. “There was great ...”

line 29: brackets around 2007 only, not around Severi

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line 14: replace "too young ages” with “ages too young”

line 27: after “ambiguous beyond” add “this level”.

Constructing the Chronology

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line 3: 779+/-5 a BP (insert “a”)

line 7. Can you provide a reference for a global signal from changes in production rate of 10Be and 14C ?

line 25: change “ follow closely” to “closely follow”

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line 19: “Parrenin et al. (2007)”

line 24: delete one of the “rapidly”s.

line 24 annual layer thickness unit is mm, not mm/a (see next line).

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line 3: the time-resolution of the data is better at EDML ...

line 10: fix brackets on Parrenin reference.

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5 Conclusions

line 24: 150 ka - I do not know what the preferred units are for ‘Climate of the Past” , but I am sure that the preference will be for consistency.

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line 20-25: The “geothermal heat flux” argument is not mentioned anywhere above, and therefore should not be here, in the conclusions. If it is regarded as important to include it in this paper, it should be discussed above in a separate section. It seems to me however, that it is not critical to the content of this paper (what is important here is only that there is melt, for whatever reason), and therefore, that the “geothermal heat flux” argument can be deleted from here, and from the Abstract.

Fig 4 Caption:

line 2, change “after it was not taken as” to “after it was no longer taken as”

Fig. 5 caption:

Mathematically, a line is defined as straight. Therefore the marks on Figure 5 are not lines, they are curves.

Line 5: change to “Also marked, are the ..."

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