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Interactive comment on "A first chronology for the NEEM ice core" *by* S. O. Rasmussen et al.

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This paper simply describes how the first chronology for the NEEM core has been obtained. This is entirely a secondary age scale, involving no new chronological information, but is simply a transfer, using volcanic marker patterns of the existing extended Greenland age scale onto a new core. While this might ordinarily seem insufficient to justify a new paper by itself, the NEEM core is likely to be sufficiently important and often-quoted, that I believe this paper is justified and should be published in CP. The paper does a good job of explaining the painstaking detail that has gone into the cross-matching. It also provides some additional value concerning accumulation rates, thinning and delta-age. In general the paper is in good shape, and uncontroversial, and I provide here only some specific comments to sharpen it up in places.

Abstract: I suggest giving the name of the age scale (GICC05modelext-NEEM1) here

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in the abstract, and specifically recommending that authors use this nomenclature in any plot that uses this chronology. This will ensure the utmost clarity in future work.

Page 2971, line 14. This is not quite precise: it is not that the high accumulation rates lead to rapid thinning at a particular depth; the point is that the high accumulation rates mean that the age at which rapid thinning occurs is lower at Dye 3.

Page 2972, line 23: Seierstad et al 2013 is not in the reference list. line 28: Do you really mean that NEEM will contribute to refinement of GICC05modelext, or really just to that of GICC05? If you are discussing changes in the early Holocene, then it is misleading to suggest that it will play any role in the modelled part.

Page 2973, line 26/27. "was similar" but "is polished"; choose a tense!

Page 2975, lines 1-12. It would be worth pointing out that, even if the measurements were completely reproducible, the peaks would not be the same magnitude at two different sites, even next to each other (I could point you to Wolff, E. W., E. Cook, P. R. F. Barnes, and R. Mulvaney (2005), Signal variability in replicate ice cores, J. Glaciol., 51(174), 462-468 for a demonstration of this (sorry to suggest one of my own)).

Section 2.3. To be consistent with the section on ECM, this DEP section should include a sentence of two about what the DEP signal represents (acidity plus some other chemistry, meaning that spikes mainly represent either H+ or ammonium).

Page 2978, lines 17/18: please re-word this so it is a little more understandable to a non-expert.

Page 2981. Please add a figure with the matchpoints between about 2125 and 2200 m in each core (ie ECM or DEP peaks) so the reader can judge for themselves whether they are happy that you have transferred the timescale correctly, given the large and abrupt jumps seen in Fig 4.

Page 2982-3. Was going to write that this example provides a warning about relying too strongly on matching tephra signatures, but the note added by Rasmussen to the

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discussion seems to negate that.

Section 3.2. I am surprised that you don't show the NGRIP and NEEM isotope record after synchronisation, just to show us that the volcanic match leads to (I assume) a perfect climate match. I think the reader will expect this, and you'd need a good reason not to include it.

Page 2988, line 11: You need first to explain that the changed relationship could be because the accumulation-temperature relationship has changed, or because the temperature-delta relationship has changed. I think it would be helpful to make this distinction clearly, especially given recent modelling studies that suggest the latter is important.

Page 2990, last few lines. This change in the model depending on calcium seems to have been important, but we cannot judge it because it refers to unpublished work. Please give some more information about how it affected the outcome, and how you chose the parameters alpha and beta.

Page 2991, line 2. How/why was 0.562 chosen, when we know that something very different has been derived for some of the major past changes (using paleothermometry and/or 15N)?

Section 5. It is essential these files are provided when the final version is accepted, thank you. Please can I request that the NEEM depth age relation has two age columns: one in b2k, the other in bp(1950) or however you prefer to say it. This is not to be against b2k, but doing that makes absolutely sure no-one reading the file can miss the significance of the 50 years they may otherwise get confused about.

Page 2996, line 24: Chappellaz listed twice.

Fig 8: Please explain what the black points are in the caption (are they the 15N tie-points?).

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