

## ***Interactive comment on “A first chronology for the East GReenland Ice–core Project (EGRIP) over the Holocene and last glacial termination” by Seyedhamidreza Mojtabavi et al.***

### **Anonymous Referee #1**

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#### General Comments:

This paper presents an initial timescale for the EGRIP ice core from Greenland. Overall, this manuscript is relatively straightforward and the scientific context and results are presented well. However, I have two primary concerns that I think need to be addressed before this manuscript is suitable for final publication.

The topic of this paper is transferring the existing GICC05 timescale to the new EGRIP core through volcanic tie points. While ample detail is provided on the existing ice cores and on measurement details, very little explanation is given to the details of linking GICC05 with the 373 tie points. The entirety of this process, is briefly summarized

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in a short paragraph in section 2.4 whereby a simple linear interpolation is used to link these tie points and the uncertainty associated with GICC05 is transferred to GICC05-EGRIP-1, with little to no treatment of the additional uncertainties associated with the transfer. I think the methods the authors used may be fine, but they definitely need much more explanation, clarification and justification than is offered here. Please see the comment below for Line 225, since I also think that some further analysis is needed both in justifying the interpolation scheme as well as in quantifying the timescale uncertainty.

There are issues with writing clarity and grammar with some mistakes (which I have not completely listed). These issues make it difficult to completely understand the manuscript. While the quality of writing is high enough to understand most of the science presented in this manuscript, I would recommend that the authors spend time refining the grammar and sentence structure of the paper to improve readability.

While these issues are important, I believe that they can be addressed by the authors in a revised version of this manuscript. The research presented so far clearly represents a lot of work and it is exciting to see new progress from the EGRIP project. Thank you for your efforts so far!

#### Specific Comments:

Line 6: Are the 373 match points spaced throughout the entire ice core?

Line 7-8: How deep is the core in total? Do you have a total age estimate?

Line 15: change 'reflect' to 'reflecting'. Not sure what 'immediate' means in this context.

Figure 1: Excellent figure.

Line 78: Change “was” to “were”.

Lines 78-94: Are these procedures novel and unique to this study? If so, I would recommend including a diagram or schematic. If very similar methods have been using

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previously, referencing them in this section would be helpful.

Figure 3: I would suggest writing out in plain language the y-axis label and including units in the axis labels and/or caption.

Lines 113-114: It would be interesting to know some information about the amount of breaks or missing ice at various depths. I would suggest adding a few descriptive statistics on core quality at different depth and especially in the brittle zone.

Lines 119-120: It is unclear to me what 'it' or 'protocol' are referring to in this sentence.

Lines 123-124: This sentence needs more context. Why does the DEP data need temperature correction? How did you accomplish this and at what stage in your procedure? I (and most readers) have not been to EGRIP, so we will need some explanation of what the 'science trench' and 'core buffer' mean and their implications for the DEP data.

Figure 4: What percentage of the data was removed? For permittivity it looks like the 'bad quality' measurements encompass a large amount of data.

Line 143: I suggest switching 'used' to 'final'.

Line 150-151: I am having difficulty following this section since 'bag marks' and 'break marks' have not been clearly defined.

Figure 6: Why not show Mazama data from NGRIP? In any case, this is a very convincing figure.

Section 2.4: Did you set quantitative thresholds for how much accumulation variability and core smoothness, or were the results inspected qualitatively. If the former, what were the assumptions you used?

Figure 8: There should be only two Es in NEEM on the y-axis label. Also what do the pink/red bars in the brittle ice zone signify?

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Section 3.2: If I understand correctly, you found 3 matching tephra horizons out of 373 total matches. Is this correct? How many other tephra events have been sampled so far? How many more do you plan to sample? Have there been many other events sampled that do not match any event in NGRIP or NEEM? This continuous tephra sampling is very impressive and interesting and more details would be appreciated.

Line 221: 1383.84 meters in EGRIP right?

Line 225: What is the longest section between tie points? 0-2 years seems an unrealistically low uncertainty to report if there is no annual layer counting. We can see in Figure 9 that accumulation rate changes on multiple timescales and presumably has variations within the spacing of your tie points as well. None of the purely mathematical interpolation methods will account for this possibility. I think you need to include some analysis that incorporates the observed variation in annual layer thickness, either from layers visible in the EGRIP ice core or from meteorological data. You can use this data in conjunction with your tie points and their spacing to generate more realistic estimates of uncertainty and potentially improve the timescale itself.

Line 226-230: I'm afraid I do not fully understand either of these sentences, which I think are important. I would suggest adding clarification.

Line 236: How do you know the upstream accumulation is higher? Is there a reference for this? Or are you inferring this from the flatness of the 0-8 ka accumulation curve in Fig. 9? How do you separate the spatial versus temporal signal in reconstructed accumulation?

Line 239-240: The phrase "EGRIP layers start to get thinner, but remain nearly constant in thickness" seems to be a direct contradiction. Please clarify.

Line 249: How deep is the full core and what is its anticipated age?

Line 260: Why not upload the timescale also at annual resolution to be more useful for other users? I'm assuming that you will include match point data for all 373 matches

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as well at the 3 tephra horizons reported here.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-143>, 2019.