

Clim. Past Discuss., referee comment RC1
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Comment on cp-2022-94

Anonymous Referee #1

Referee comment on "Evaluating the 11-year solar cycle and short-term ^{10}Be deposition events with novel excess water samples from the East Greenland Ice-core Project (EGRIP)" by Chiara I. Paleari et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2022-94-RC1>, 2023

General Comments

Paleari et al. present a new way of measuring ^{10}Be in polar snow/ice by using the excess of meltwater from continuous flow analysis (CFA) instead of discrete snow samples in EGRIP S6 firn core. The authors investigate the agreement with other ^{10}Be records from Greenland measured in a "traditional" way. They also use this record to study the 11-year solar cycles as well as the short-term SEP events and stratospheric volcanic eruptions. This new way of measuring ^{10}Be opens new opportunities for the collection of continuous records with less time-consuming sample preparation while saving an important portion of the ice cores for other measurements.

The paper is an introduction study to advertise the opportunities of using ^{10}Be measured by CFA technic to investigate solar cycles and short-term ^{10}Be deposition events. The analyses on the ^{10}Be record are not very deep. On the other hand, the new measurements technic is promising. So, my two main comments, among others, are about the CFA technic that should be more highlighted and the (non-)detection of ^{10}Be short-term events related to SEP or volcanic eruptions. I recommend major revisions before acceptance for publication in CP.

Specific comments:

- The preparation of the CFA samples is described in section 2.1. In addition, I think it would be beneficial to add the schematic figure summarizing this preparation.

Moreover, it would be interesting to know how much time is effectively won when using this technic instead of the classical extraction from ice or snow samples, as well as the quantity of ice.

- I am not completely convinced that ^{10}Be from CFA can be used to detect SEP or volcanic eruptions. As the authors said, "one of the main complications of dealing with CFA systems is the possible smoothing of the signal locked in the ice" (see grey and green curves in figure 3). Moreover, is the temporal resolution of the EGRIP S6 core (yearly) enough for such detection? It should be discussed in the manuscript. Finally, the analysis can be misleading in its present form. The authors just state the years when the residual is more than 1-sigma, and it is difficult to know if these years correspond to some events or if they are due to local effects. To improve the way how are presented the analyses, I suggest replacing the histogram figures (figures 6, 7 and 8), which are not really used in the manuscript, by the standard score records shown in Supplementary Material. In these graphs, the authors could add colored dashed vertical lines corresponding to major volcanic eruptions and SEP events. In this way, it would facilitate the analyses and it would be easier for the readers to see if the standard score peaks correspond or not to these events. I would also suggest coloring the curves if the standard score curve is higher to 1-sigma, 2-sigma..., like for climatological indices.
- The comparison of EGRIP S6 with other Greenland ice cores is quite convincing (figures 3 and 4), while it is not so much the case for Antarctica. I would rephrase the sentence "our results indicate that the signal measured in the CFA samples is reproducing the common radionuclide signal in Greenland and Antarctica as well as the discrete firn samples" at lines 218-219. Moreover, how the correlation is improved if instead of "global stack – no EGRIP", a Greenland stack – no EGRIP is used in Figure 5? Do the ^{10}Be normalized records correspond to ^{10}Be concentrations records (and not flux) for both Greenland and Antarctica? Please precise.

Minor comments and corrections:

- 1st sentence of the abstract: " ^{10}Be is produced by the interaction of galactic cosmic rays (GCR) or solar energetic particles (SEP) with the Earth's atmospheric constituents."
- Section 2.3: The authors adopted the timescale by Zheng et al., submitted. Because this paper is under review, the readers have no complete information about the timescale of EGRIP.
- Table 1: highlight in color the years corresponding to SEP or volcanic events.
- 11-year cycle: I suggest doing some spectral analyses, too.
- Figures in Supplementary Material are not referenced in the main manuscript while they are useful. I suggest replacing the histograms by these figures (see general comment). The histograms can go in supplementary material if the authors want to keep them.