Response to Weiss review.
We find the re-interpretation of papers that Weiss has attempted (many of which we wrote ourselves, or on which we were co-authors) quite a remarkable effort in revisionism. But a passionate defense of a paradigm in which one is heavily invested is not a sufficient reason to dismiss our review of the literature. We address the individual points raised by Weiss below, but first we offer some general comments.

The title of the Special Issue to which our paper was submitted, is "**The 4.2ka B.P. EVENT**". So, what is "an event"? The word derives from the Latin, "*eventus*" meaning a singular happening, an occurrence, an incident. It clearly implies something that has a beginning and an end, otherwise it would not be an event. And, in the case of the Special Issue, this event must be dated at 4.2ka B.P. It is abundantly clear that there was a shift in climate between 5000 and 4000 years BP, leading to a period of neoglaciation (cf. McKay et al., 2018). The subsequent millennia witnessed a series of climatic oscillations that led to the advance and retreat of alpine glaciers, culminating in the most widespread advances, which occurred during the last millennium. As neoglaciation set in, it is no surprise that some glaciers advanced around 4.2ka B.P. (as in the case of Kulusk, SE Greenland and at Hajaren, Svalbard where we have worked) while others advanced somewhat earlier, and others somewhat later. But one cannot ignore the fact that there was an underlying, systematic change in climate beginning around ~5ka B.P. Around the North Atlantic, this change in climate involved a cooling trend, and multidecadal to centennial fluctuations were superimposed on that trend. Cherry-picking records that happen to show a multi-decadal anomaly around 4.2ka B.P. (or at other times before or after that time) in order to promote the notion of a global-scale climate disturbance is not good scientific practice. Yet too often those who seek to memorialize the 4.2ka B.P. time period have brushed aside chronological uncertainties, low resolution records and inconsistent proxies in order to promote a story that does not always stand up to scrutiny. Such misguided efforts cast further doubt on the highly dubious argument for a late Holocene boundary at 4.2ka B.P., which Weiss has helped to promote (Walker et al., 2018).
We have little doubt that some proxy records provide strong evidence for a short-lived climatic anomaly (often a drought) centered around 4.2ka B.P. But many other locations do not show such evidence. If we are going to understand what may have caused "the 4.2ka B.P. event" in some areas, we first need to define which geographical areas were affected and do so objectively and without bias using well resolved records with good dating control. A good first step toward such a solution has been made by Sundqvist et al. (2014).

Specific comments:
As our paper clearly noted, "*we review sedimentary records from the northern North Atlantic (north of 60°N) with a focus on evidence for an "event" around 4.2ka B.P.* ". Obviously, that does not include research in Denmark, southern Sweden, Ellesmere Island or West Greenland so we will not address comments on papers related to those areas.

Greenland: The paper by Nielsen et al (2018) uses a model with different assumptions about the temperature and accumulation history of the Greenland Ice Sheet to derive mass balance estimates over time. Only 2 of the 6 simulations generate a signal at ~4.2ka B.P. Both of those experiments are based on data from Gkinis et al. (2014) so one should not be surprised to see a correlation between those results. The Gkinis et al. diffusion model does generate a large (4-5°C) positive temperature anomaly around 4.2ka B.P. in NGRIP, which is not seen in the Vinther et al. (2009) paleotemperature reconstructions, or indeed in any other Greenland ice core isotopic records (Fig. R1). In those records, variations in isotopes (and derived temperatures) are all relatively small (e.g. ± <1C in the Vinther et al., record, and that change mainly results from the Agassiz Ice core, central Ellesmere Island). Gkinis et al. derive their result by applying a coupled water isotope diffusion and firn densification model, with the GICC05 chronology and an estimate of the total thinning function obtained from another flow model. Given the assumptions made in this model, it would be prudent to see if the result can be reproduced in other records; such a large anomaly would almost certainly be recorded in temperature sensitive proxies, such as chironomid data in coastal lakes. So far, no such confirmatory data exist (cf. Axford et al., 2017). Kobashi et al (2017) also provide no support for such a large anomaly at 4.2ka B.P. as that derived by Gkinis et al (2014). Furthermore, the advance of ice in southeast Greenland at the same time (Kulusuk Lake; Balascio et al., 2015), seems quite at odds with such an exceptionally large *positive* temperature anomaly on the Greenland Ice Sheet. So, while we are intrigued by the results of Gkinis et al.,(2014) we are not yet convinced. Nevertheless, for the sake of completeness, we were remiss in not mentioning their reconstruction in our summary.

Svalbard. The van der Bilt (2015) evidence for an ice advance was mentioned in our paper. van der Bilt et al (2018a) indicate a drop in temperature of ~2C at 4.2ka B.P. in Lake Hajeren. However, there is no comparable event signal in the adjacent valley where glaciers advanced later in the Holocene (Røthe et al., 2017). Gjerde et al. (2018) was not "misrepresented". Luoto et al (2017) reveal no warming at 4.2ka B.P., nor does Balascio et al. (2018). I note here that both Bradley and Bakke were co-authors on all of these papers (except Luoto et al) and conducted fieldwork in all of the sites mentioned so it is somewhat bizarre to find our results being reinterpreted by Weiss. Such efforts say more about the underlying motivation, which is to find something everywhere, when it may not exist. We have tried to be more objective.

In the **Faroe Islands** (where Bradley and Bakke have also worked) Andressen et al find a drop in silica and increase in clastic material at 4.2ka B.P., which are comparable in magnitude to earlier periods. They assign a zone boundary to 4.2ka B.P. but do not recognize this as an event; rather, it signals a change in sedimentary regime (S4) which continued to ~2000 B.P. Similarly, the Olsen et al. (2010) and Rasmussen et al. (2010) papers recognize a change at ~4ka B.P. which indicates the onset of neoglacial conditions in the archipelago (Olsen et al.'s Zone 8). This conforms to our overall conclusions.

The **Icelandic evidence** has been reviewed by Geirsdottir et al. (2019) and as we noted, we did not attempt to duplicate that paper. Now that it has been accepted, we will reference its conclusions in revisions to our paper.

Additional papers cited:

Axford, Y., Levy, L.B., Kelly, M.A., Francis, D.R., Hall, B.L., Langdon, P.G. and Lowell, T.V., 2017. Timing and magnitude of early to middle Holocene warming in East Greenland inferred from chironomids. *Boreas*, *46*(4), pp.678-687.

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Sundqvist, H. S., Kaufman, D. S., McKay, N. P., Balascio, N. L., Briner, J. P., Cwynar, L. C., et al. (2014). Arctic Holocene proxy climate database—New approaches to assessing geochronological accuracy and encoding climate variables. *Climate of the Past*, 10, 1605–1631.

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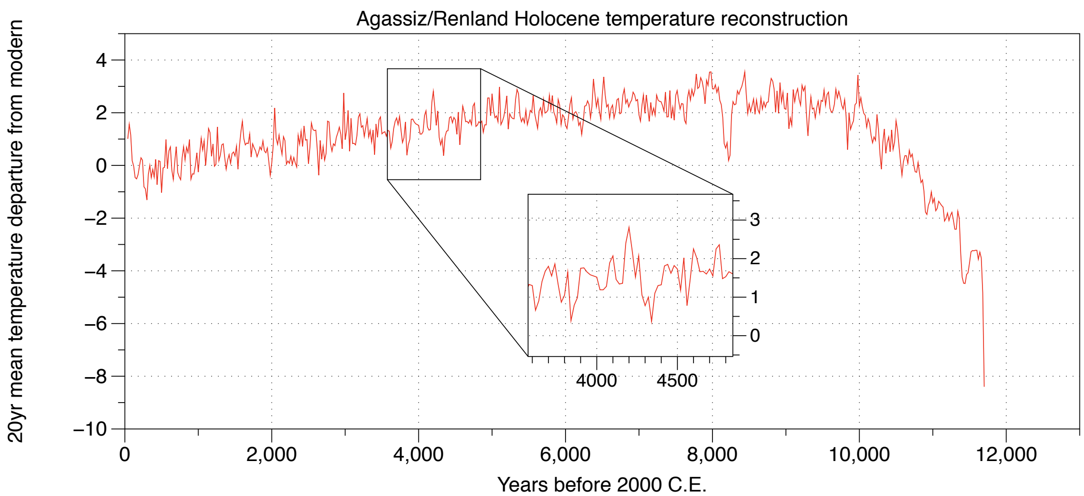

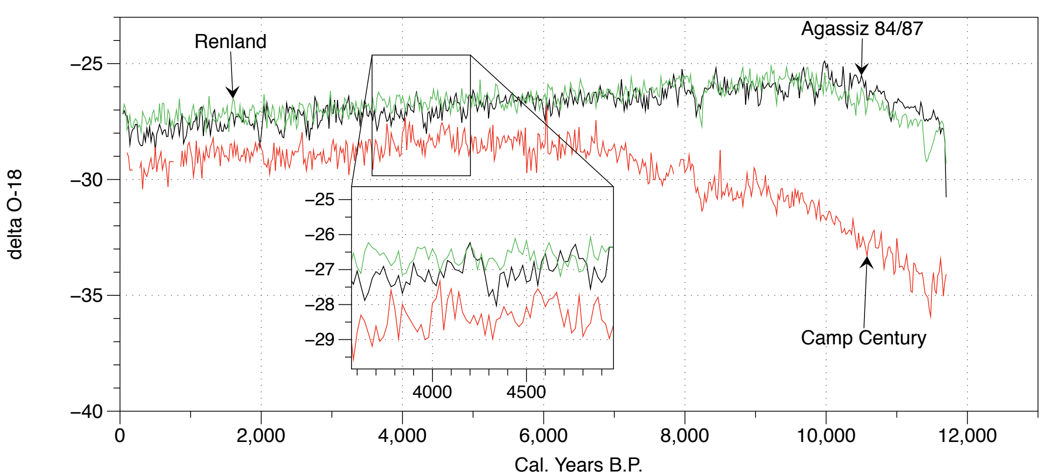

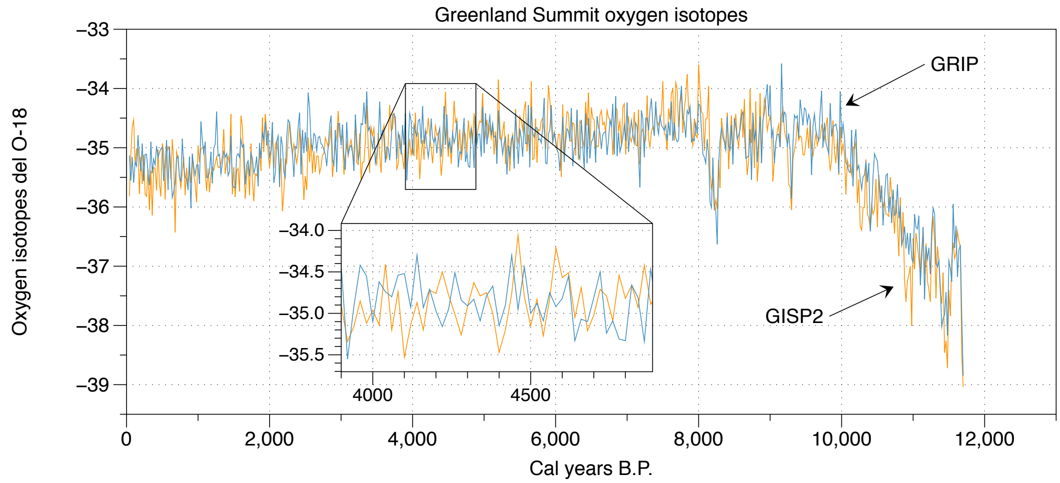

Figure R1. Temperature anomalies from the smoothed estimate of present temperatures in Greenland. Timescale is in years b2k (before A.D. 2000). The interval around 4.2ka BP is enlarged in the box (Data source: Vinther et al., 2009).