Responses to reviewers are provided here in red.
Our response to RC2 has already been provided on line, and we have nothing further to add.
We see no reason to comment on SC2, which is really addressed to the reviewer RC2

SC1
The caption of Figure 2 says: Holocene August SSTs at various locations in the northern North Atlantic (Anderson et al., 2004) and alkenone-based SSTS from sediment cores along a N-S transect in the North Atlantic Current-Norwegian Current system. I might be wrong here, but the records seem to be all alkenone records, as implied by the graph title.
Correct

I don't think there are any data from Andersen (not Anderson) et al., 2004, in the graph.
Correct!

Andersen et al., is a diatom paper. Yes, there is a diatom record from MD95-2011, but the data presented for this core looks like the alkenone data by Calvo et al., 2002.
Correct—there was a mistake in the caption, now corrected

Another thing, perhaps core locations could be added to Figure 1?
Done

RC1
Summary and major suggestions
This manuscript addresses an important and interesting central question – whether there is evidence for a prominent "4.2 ka event" in paleoceanographic and terrestrial paleoclimate records from the northern North Atlantic regions directly affected by the North Atlantic Current and East Greenland Current (excluding Iceland, which is covered in a parallel submission by other authors).

This paper can make a valuable contribution, but it will benefit from some major additions:

> It should be made clear exactly what records are considered in this study, and (if they are a subset of published records) why these records were chosen. For example, section 2 begins with "we consider a transect of sediment cores," but what sediment cores are referred to here, and why are these cores in particular singled out? Is the C1 "transect" a list of all available records the authors could find from the region? Or a subset of published records selected for some specific reason?

We examined almost all published sediment core records from the northern North Atlantic. It is quite clear that there are different signals recorded by alkenones and diatoms compared to forams. The former reflect near-surface conditions (in the photic zone or mixed later) thus providing paleo-SST estimates. in Figure 2, we plot alkenone-based SSTs so that the records are comparable in terms of the seasonality and depth represented; locations are shown in Figure 1. As far as we are aware, these are the only published alkenone-based SSTs from the region (cf. Leduc et al., 2010). We note that alkenone-based SSTs from sediment cores to the south and west of the area in Figure 1 show an almost linear decline in temperature from ~7ka B.P. to the

present, but with no unusual anomaly around 4.2ka B.P. (see Sachs 2007, Figure 2B). It is thus fair to conclude that throughout the range of the Atlantic current, from (at least) ~48N to 75N, there is no significant anomaly around 4.2ka B.P.
As noted on lines 89-90, Mg/Ca ratios and oxygen isotopes in forams, as well as foram assemblage changes show a different pattern, reflecting sub-surface conditions. Nevertheless, these proxies do not reveal an anomaly around 4.2ka either.

Choice of sites used in all parts of this study should be clearly explained (and justified if the study is assessing a subset of published records), preferably (for clarity) in a short "Methods" section (which is currently lacking from the paper).
This is now made clear for the paleoceanographic records discussed in Section 2 (on lines 56-60). For the terrestrial records it seems reasonably clear that we are reviewing the available lake sediment, ice core and glacier records from areas adjacent to the northern North Atlantic.

Site locations should be added to Figure 1. Optionally, a table listing all sites, locations, proxies, and original publications would be useful.
The data sources and locations are now listed in the caption to Figure 1, and color-coded to link to Figure 2

In my opinion, all of the datasets described here should be shown in the paper's figures. (As an example, Fig. 4 is a nice way to visualize a large number of glacier reconstructions; although it is unclear whether that figure is updated with records obtained since 2009.)
It would also be useful to include a statistical summary/ analysis of the data, as an objective test for a 4.2 ka event.
This would require a standardized data screening protocol (to assess dating control, data quality and analytical uncertainties, sampling resolution etc) (e.g. McKay & Kaufman 2014, *Sci. Data*, 1, 140026). We did not approach the published records in that way as we found it relatively straitforward to address the question posed: was there an unusual event at 4.2ka B.P.? That is quite easily answered by inspection of the records, as Figures 2-4 clearly demonstrate. Papers published since 2009 are discussed.

Very few of the data used to support the paper's main conclusion are shown, and there is no particular methodology of site selection or analysis described. Thus, with the information provided, it is impossible for readers to evaluate or appreciate the evidence. I personally trust the authors' expert knowledge of records from the region – but that alone is not a strong enough basis for their conclusions to be published in COP.
As with any review of the literature, we have attempted to examine any and all published papers that pertain to the question posed in the title of our paper: *Is there evidence for a 4.2ka B.P. event in the northern North Atlantic region?* That was our methodology—to read the literature and draw conclusions from the published records. We do not think it is necessary to reproduce all of the records that have no evidence for the 4.2ka B.P.—that would be a mammoth task. We have cited a large number of papers that provide the basis for our conclusion that **there is no compelling evidence for a "4.2ka B.P. event" in the northern North Atlantic region**, except for a few records that we explicitly mention.

The goal of this study is to assess whether a 4.2 ka event is a coherent feature of Holocene climate in the study region. Yet most of the text actually summarizes multi-millennial climate trends through the Holocene, and only relatively short sections of text discuss/evaluate evidence for 4.2 ka events in various regions.

In the first part of section 2, for example, lines 55-84 summarize multi-millennial Holocene trends, then lines 85-94 assess higher-frequency events and conclude there is no 4.2 ka event. Same for lines 96-118 (which review multi-millennial trends) vs. lines 119-124 (which evaluate evidence for/against a 4.2 ka event). Given the goal of this study, I would expect to see relatively more extensive discussion of high-frequency events, and the evidence for/against a prominent, coherent 4.2 ka event. If statistical analyses are added as suggested above, that will help flesh out the discussion.

We feel that it is important to document the primary paleoclimatic signal in the region, which is the multi-millennial decline in temperature over the course of the mid to late Holocene. That is the signal that dominates almost all of the records examined. Superimposed on that are multi-decadal to century scale variations (as noted for example, on lines 98 and 191). Such variations are to be expected and so the question that guided us in this review was: is there evidence for an exceptional event at 4.2ka B.P. that stands out, **beyond the range of such variability**? It is clear that this is not the case, except in the few instances that we have noted, but is important to note, as we have done, that there was an overall deterioration in climate that began prior to 4.2ka B.P. That is a low frequency change, not an event. It does not serve the goals of this paper to examine in great detail all of the multi-decadal to century scale anomalies that occur in virtually every record.

Minor comments

What convention is used to subdivide early from middle from late Holocene? e.g., the Abstract refers to the period 8-6 ka BP as part of the early Holocene, though in many subdivisions this would be considered part of the middle Holocene.

Reference to the mid-Holocene has been removed from the Abstract and the final paragraph

Depending on the desired geographic scope of this analysis, additional terrestrial records that could be included from east Greenland include Levy et al 2013 QSR (Bregne ice cap) and Lowell et al. 2013 QSR (Istorvet ice cap). Neither is ideal to capture subtle climate changes ~4.2 ka, but these records may help make the authors' point about idiosyncratic glaciation thresholds for individual glaciers/catchments.

It is not clear why these papers should be cited; we take the point that Lowell et al. refer to a gradient in ELA so that different parts of the ice cap may respond differently to a change in ELA, but they only address changes in the ice edge over the last ~2000 years. Furthermore, the discrepancies in their study, pointed out by Miller et al. (2013), make it difficult to rely on their conclusions. A better reference for this point is Geirsdottir et al., 2019, which we now cite in relation to this.

The Bregne Ice Cap study seems less relevant except that it reveals no evidence for an abrupt change in climate around 4.2ka B.P.

Line 19: It appears this paper is to be part of a special issue focused on the 4.2 ka event, so I understand why there is not an introduction to the broader (global/hemispheric) significance/question of the 4.2 ka event. Nonetheless, it would be helpful for future readers (who may read this paper on its own) if the Introduction began with at least a couple of sentences of background on the 4.2 ka event more broadly, rather than beginning by discussing Bond events, to clarify why testing for climate shifts at 4.2 ka (vs. shifts correlating with other Bond events) is of particular interest.
Text has been amended in the opening paragraph to set the stage for why this review is relevant.

Line 37: The Geirsdottir review of Icelandic records appears to be published (or nearly). These findings from Iceland seem highly relevant to the current study and should be briefly summarized and discussed somewhere (Section 3.3?).
The Icelandic evidence is now discussed in Section 3.2, with reference to the work of Geirsdottir et al (2019)

Line 75: "in all cases" SST cooling specifically? Meaning all published studies? Or cores in Fig. 2?
This referred back to the previous sentence where we say "i*n all proxies that are indicative of conditions in the photic zone*". We removed the second phrase "*in all cases*" to clarify this, since we already stated it.

163: Omit extra comma after "at"
OK

Line 181: Why compare the coldest and warmest 20-year periods of the Vinther record, rather than stick to describing millennial-scale changes? Comparing the warmest and coldest millennia would seem more consistent with the rest of the discussion of multi- millennial scale changes. As currently written (e.g. followed immediately by the phrase "Superimposed on the long-term temperature decline. . .") 4.9 C comes across as an estimate of the long-term, multi-millennial temperature change inferred from the Vinther reconstruction (for which it would be a major overestimate).
OK, we amended this by calculating the difference between the most recent millennium and the period from 7-8ka b2k, and 8.5-9.5b2k. We now state [lines 188-190]:
" *The warmest (7-8ka b2k) and coldest millennia (0-1ka b2k) differ in temperature by ~2.35°C (assuming no change in the seasonality of snowfall on the ice sheet)*"

Line 249: The concluding sentence states that "*Although a few records do show a distinct anomaly around 4.2 ka BP (associated with a glacial advance) . . . we interpret it as a local signal of overall climatic deterioration that characterized the late Holocene.*"
Is this consistently the onset of (subsequently more-or-less continuous) glaciation, as opposed to a transient, short-term glacial advance? If the former, which is what I gather from the

previous discussion, then stating that more clearly here would strengthen this final assertion of the paper.
We have amended the sentence to be even more explicit:
"*Over the last 5000 years, a series of multi-decadal to century scale fluctuations occurred, superimposed on an overall decline in temperature. Against this background of declining temperatures, three records in northwest Greenland and Ellesmere Island show an unusual warm anomaly around 4.2ka B.P., and a few others (in SE Greenland, Iceland and western Svalbard) show a cold anomaly, associated with a glacial advance. We interpret these as local events -- simply one glacial advance of many that occurred in response to the overall climatic deterioration that characterized the late Holocene.*"

Fig 1. Locations of study sites mentioned in the text should be shown in this figure. Fig. 2. Why are data plotted only from these sites?
Figure 1 now shows the location of sites used in Figure 2. The reason for the site selection is discussed in the related text.

Fig 3. It would be useful to see Kobashi et al. 2017 also plotted, given the different sub-millennial variability in that record.
Done—added in Figure 3d.