This paper presents an overview of the scientific history of the Camp Century sub-glacial sediment that was drilled in northwestern Greenland from 1960-1966 CE. It also presents detailed descriptions of the sampling approach, a physical characterization of the sediments, and some scientific data (e.g. paleomagnetic data, pH, and conductivity). In this sense, the paper represents a mix between historical accounts and scientific results. However, I believe this approach is fully justified, and I enjoyed reading the historical accounts of the drilling projects at Camp Century in northwestern Greenland. It is important to document how this rather unique sedimentary archive was retrieved, handled, and stored. The paper is very well written, and the topic is suitable for the journal. Below, I provide a few suggestions and comments that I hope the authors will consider.

Thank you for your thoughts on our work.

General recommendations

The paper provides a detailed description of the sampling approach that was applied to the material available from cores drilled between 1960-1966 CE. Now that the authors have the benefit of hindsight, I wonder if they have any recommendations concerning the processes that preceded their involvement with this material, such as the initial sample treatment, documentation, and storage. This kind of advice could prove useful for future efforts to recover sediment cores beneath ice sheets.

This is a very interesting idea that we had not considered. Thank you for this valuable suggestion. We will add this to our discussion.

A few ideas come to mind that we will consider in revision.

1. *Preserving sediment without light exposure allows it to be dated by luminescence (done at Camp Century, EastGrip, NEEM, but not at GISP2 and Dye3). Documentation (such as percent recovery during drilling) is also important.*
2. *Maintaining detailed and accurate records of transport/storage conditions from time of collection, avoiding contamination impacting future analyses, and considering ways to minimize pest accessibility in collection/storage/transport is key (e.g., a modern carpet beetle made its way into the Camp Century samples over the last 50+ years).*
3. *For biomarkers, drilling and sampling in a way that avoids contaminating both the lipids (considering the use a drilling fluid that doesn't contain hydrocarbons) and the DNA/RNA (i.e., collect in sterile containers, using sterile sampling equipment) – realizing of course limitations of the polar environment although such work has been pioneered in sub-ice Antarctic lakes.*

4. *Perform bulk density measurements – even roughly (by weighting and measuring volume) – will useful at an early stage of the core processing (even feasible in the field, ideally before core cutting).*
5. *We will stress that Camp Century has taught us the importance documenting all post-coring sampling activities and the value of sustained funding and support for ice core storage facilities that make it possible for future researchers to come back to a core many decades later.*

Paleomagnetic data

Upon reading the paper, I felt it would have been appropriate to show the pmag data discussed in section 4.4 on a figure (and not just in table S5). For instance, the NRM (or 20 mT) data could be displayed on a panel in figure 8, but it is also clear that it isn't straightforward to interpret the data, mainly because the inclinations are scattered (the declinations are bound to scatter at this location). On that note, I think it would be useful if the authors could comment on the high degree of scatter – are there any trends related to the type of material or stratigraphic unit? Although the samples may not be equally susceptible to acquiring a viscous overprint, I would not expect this pattern if the NRM is dominated by a viscous overprint from storage at NBI. It would also be informative to know if the scatter tends to decrease after demagnetization, even though demagnetization at 20 mT may not be sufficient to reveal any patterns. Finally, it would be good to know if the pmag data associated with the six core segments that were stratigraphically inverted during storage stand out, or differ, from the remaining data, as would be expected if the viscous overprint was acquired during storage.

I realize that a detailed discussion of the pmag data may be outside the scope of this paper, so I will let the authors decide on how to deal with this.

Reviewer 1 had similar questions regarding any trends in the AF demagnetization data, signatures of storage diagenesis, and whether aberrant behavior was observed in the samples that were stored upside down. In response to those questions, we have added the following text to end of section 4.4:

"The majority of our samples display positive inclinations, consistent with normal polarity, with the possibility of 3 reversed polarity or excursion intervals in Units 1 and 2 recorded in samples 1061-D1, 1062-3, and 1061-D3. Although the AF demagnetization data is limited, these samples display inclinations that become progressively more negative at higher AF levels, consistent with removal of vertically downward overprint, or inclinations that remain moderately negative at all AF demagnetization levels."

Our response to reviewer 1 elaborates on the observations in the 3 samples named above that led to these interpretations. For the sake of space, we do not present a detailed treatment of the paleomagnetic data here, which we believe is controlled more so by the magnetic mineral assemblage than by the ambient magnetic field at the time of sediment deposition. We will address this in a dedicated paper on the rock-magnetic results of the Camp Century core.

Sediment/ice vs. bulk density

At the boundary between Unit 2 and Unit 3, the composition of the core material changes from ice-dominated (~80% ice) to sediment-dominated (~20% ice). This abrupt transition is not clearly reflected in the bulk density, which shows a very gradual change towards higher density. Why this gradual change in bulk density? Is it due to different sample resolutions associated with the sediment/ice versus bulk density measurements? Please comment on this.

This apparent discrepancy between density and ice content is mainly due to a sub-sampling approach to measure the ice proportion, while the bulk density was done on longer full ice cylinders, at lower resolution. Moreover, the contact between Unit 2 and 3 is not horizontal but tilted; several cobbles are also embedded in the top of unit 3. We can make the log more accurate by drawing an angular and more discontinuous contact here and will clarify this difference in the text.

Changes in conductivity and pH

Lines 482-490 describe changes in pH and conductivity (Fig. 8H). The details of this plot may not be the focus of this paper, but I'm curious about the variability in these parameters – particularly those that differ from the trend described in the text (e.g. line 485: "pH is a mirror image of the bulk density profile"). In this context, I wonder why the pH is low in the bottom and upper parts of Unit 2 (it is similar to the pH of Units 3-5), which are dominated by ice (~80% ice). Also, I wonder why the conductivity is high in the upper part of Unit 1, which is explained by a high percentage of fine grans (line 484). However, similar amounts of fine grains are found both below (e.g. 1063-5) and above (e.g. 1060-c2), where the conductivity is considerably lower. I guess the conductivity is controlled by the amount of dissolved ions, but does that correlate with grain size (I guess it might)? Any comments on this?

This comment caused us to think more about the patterns of pH and conductivity with depth and the correlation of these parameters with other measures including the percentage of fine grain material. In making such comparisons, it's important to consider unit two is predominately water and that the other four units are predominately soil; thus, the controls on pH and conductivity likely differ between the units. Regression analysis shows no significant correlation between any combination of conductivity, pH, and grain size but distinct clustering; for example, the graph to the left shows that the till (unit 1) has little variance in pH but large variance in conductivity. The former likely the result of soil buffering and the latter possibly the result of soil/water interaction and the competing processes of dilution by meteoric waters and the chemical weathering of the soil. In contrast, unit 2 (the ice) has consistently low conductivity but a wide variance in pH, likely the result of low buffering capacity and the lack of sediment grains to provide ions that would increase conductivity. In revision, we will consider these relations and revisit the text adding graphics like the one provided here.

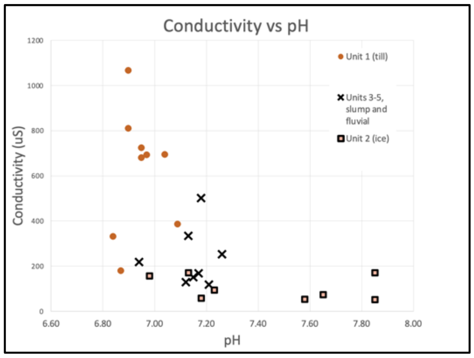

Figure 5

Nice and informative figure. However, it is not clear to me what the authors mean by "Geochronometry" in the table. Luminescence and cosmogenic nuclides are mentioned elsewhere – do you the authors have some specific dating methods in mind?

Size fractions of this materials are being used for measuring a variety of geochronologic measurements including U/Th/He and solid state measurements by ICP- LA-MA including Pb. We will elaborate in the caption and/or the text.

Future availability of material

It would be good to include a statement towards the end on the future availability of material – and how this process is expected to work. Also, I'm curious about what it will take to make the archive half available for analysis (who will decide this?).

This point has been noted by other reviewers and will be addressed in revision. In summary, left over material in the US will be accessed per US ICF protocol and the material in Denmark will be administered by Danish protocol.

Line 569: Guess "JP Stephenson" should be "JP Steffensen".

Thank you, spelling corrected.

Line 581: “…has declares…”. Perhaps “has declared”?

Thank you, grammar corrected.