We thank the reviewer for their valuable comments and suggestions, and find them very helpful for improving and clarifying the manuscript.

It is not immediately clear why the sedimentological information referred to (particle size and IRD) has not been presented in this paper also. This data is often used to interpret glacier retreat rates – I suspect it would make for a much stronger final paper by combining with the faunal data. There may end up being overlap with paper submitted to Journal of Quaternary Science referred to in the manuscript.

Sedimentological data (i.e. IRD) is indeed often used in combination with foraminiferal data to assess the relationship between oceanic changes and glacier activity (iceberg calving). A standard approach would be to show the grain-size/IRD data from this core, present it as a proxy for glacier calving and then attempt to interpret their relationship. Thus I can see it comes across as somewhat strange that I did not present the IRD record in this paper.

The main reason for this is that when we investigated IRD patterns in the fjord (based on multiple sediment cores) we found that the relationship between IRD and glacier behavior is not as straightforward as is often assumed. Therefore we decided to write an article specifically discussing the relation between IRD and glacier behavior (i.e. the JQS paper), and as such IRD was not addressed in the current article. We think that in this this way the article presented here can focus more clearly on the question 'does/did ocean variability affect glacier behavior. Also, in this study we rely on historical glacier front positions available, which are probably more accurate than interpretation of the often complex relationship between glacier dynamics and IRD (see section above). Nevertheless, we agree that it is still be worthwhile to show the reader the IRD data, so I have included this in the revised article (figure 7).

Presentation of the foraminiferal data. As above this is a fundamental part of the paper and the key interpretation and conclusions are based on the presentation of foraminiferal data. Calcareous foraminifera are presented separately from agglutinated species (Figure 5), however, the % calculation is based on the combined counts of calcareous and agglutinated specimens. As acknowledged in the paper the calcareous species are influenced by dissolution (most severely between 10 and 25 cm). Hence the relative proportions of the various species will be strongly influenced by preservation of the calcareous fauna rather than by bottom water preference. It would make sense to at least present an additional set of graphs showing the % abundance of agglutinated species based on agglutinated counts only. This would remove the influence of dissolution and would make trends in the proportion of Atlantic influenced vs Arctic influenced species clearer to identify. The same could be tried with the calcareous assemblage, though for parts of the core there would not be enough specimens to present a robust % curve. If these plots do not show any clear/useful trends, then they could at least be included in the Supp Info section so that interested readers could see that the analysis had been done.

A key aspect of this paper is the use for benthic foraminiferal data to interpret changes in bottom water conditions – specifically changes in relative importance of Atlantic Water flux across the shelf. The paper classifies the benthic foraminifera species into groups linked to bottom water conditions based on published studies (Atlantic influenced, Arctic and Indifferent). This is presented in a supplementary table. However, it is not always clear what the rationale for the choice of grouping is as for some species there is more than one potential group designation suggested in the literature. As this is such a key element of the paper I think it would be useful if the groupings and rationale were presented as part of the main paper. Or, alternatively, at least have a table in the main paper with species composition of the three groups stated, then refer to Supp Info for the more detailed rationale.

We agree that the grouping rationale was indeed too briefly explained. The table that lists all identified species and references to which ecological habit that species have been previously assigned is now moved to the main document. For species that have been assigned as both Atlantic and Arctic water indicators, we used the most recent studies (but also listing the contradicting references). It is important to note that we use these previously attributed ecological preferences mostly as a tool to investigate our dataset (i.e. to investigate whether species with similar proposed environmental preferences indeed display similar 'groupings' within Upernavik fjord. We then found that the general variation within the dataset is largely driven by the proportion of calcareous vs. agglutinated taxa present (as seen by results of the PCA analysis). PCA analysis run for each group (calcareous taxa, agglutinated taxa) seems inconclusive with regards to grouping of species by environmental preferences (Atlantic/Arctic) and we have now shown this analysis in the supplementary information (i.e. the requested abundances and PCA plots). Within the calcareous assemblage, a lack of grouping according to environmental preference can probably be explained because the info provided by species shifts is limited since calcareous species are nearly absent in a large interval. Also, little regard has been given in the literature to the sensitivity of agglutinated assemblages to environmental conditions (one of the few studies is Lloyd et al., 2006), and only one species in our agglutinated assemblage (>0.5% of total abundance) has been proposed as an indicator of Atlantic waters. Therefore, in our discussion the interpretation relies predominantly on the calcareous/agglutinated ratio, rather than the environmental preferences assigned to the species as proposed by previous work. I have rewritten parts of the results and discussion, which I hope will make this reasoning more clear.

I don't think these considerations will change the actual interpretation and conclusions of the paper, I think these are valid and generally supported by the data. Some of the points outlined above might help support your conclusions.

The key conclusion based on the faunal data is that bottom water conditions control dissolution – increased dissolution of calcareous fauna during times of colder Arctic Water influence, then reduced dissolution during periods of stronger Atlantic Water influx. This makes sense, but ought to also consider possible influence of sedimentation rate – increased sedimentation rate will lead to improved preservation of calcareous fauna (buried before dissolve). This has been identified from studies immediately in front of Jakobhavns Isbrae in Disko Bay (Lloyd et al 2005 and Lloyd 2006). You may conclude that sedimentation rate does not vary in your core, but I think this possibility ought to be presented.

We agree and have included a line about the effect variations in sedimentation rate may have on the preservation of calcareous fauna.

Section 5.2. Comparison with climatic records. This discussion is essentially based on the % Calcareous Fauna (ie preservation, Figure 7b). The manuscript suggests warm bottom waters during 1920-1960, but the basal sample from 1925 actually has a very low calcareous abundance (10%). This should be classified as cold water indicating...

This has been changed accordingly in the manuscript.

The high calcareous percentages actually seem to stretch from 1930 – 1970 based on Fig 7b. So based on the data the warm bottom waters seem to be from 1930 – 1970... I think the description/discussion ought to reflect this more clearly. The early part of the 20th Century still seems to correlate reasonably well with previous reconstructions (Figure 8f) and the AMO (Figure 8g) – particularly given some error margins in age model generation.

We agree and have rewritten this section of the discussion accordingly.

Section 5.3 Retreat of Upernavik Isstrøm and ocean forcing. The record after 2000 seems mixed, seems to be major increase after 2005 for Upernavik 1 and 2 at least, while the ocean forcing is earlier. There is some discussion about the possible role of seafloortopography–it would be useful to provide a little more information here. Have previous studies identified topographic variability as important in controlling retreat rates for the four different ice streams? Does fjord side wall configuration have an impact on retreat rates? It might also help to put a smoothing line through fig 8f so that it is more directly comparable with your ocean record resolution.

Subglacial topography indeed plays a major role in controlling the dynamics of marine terminating glaciers and there is some research available for Upernavik Isstrøm. Sidewall configuration plays a role but is less well understood. I have expanded this section in the discussion, but to address all of the literature on the subject would beyond the scope of this study. We hope the reviewers agree that we have found the right balance in the revised manuscript.

Minor points In the introduction the authors refer to previous research identifying rapid retreat and acceleration of tidewater glaciers in SE and NW Greenland – I think it would be worth making a distinction between NW and central west Greenland. The first studies identified this response from Jakobshavns Isbrae – this is probably better referred to as central west rather than northwest Greenland..

We agree and included this distinction in the introduction.

Reference by Ribergaard et al., 2008 does not seem complete

Reference is completed.

Figure 8. It would be useful to say what the colours in panels a) to d) represent (times when the glaciers split up?).

These colours indeed refer to the periods when glaciers were still together (grey) and when they split. We describe this better in the caption now.

Page 9 line 21: '...perturb glacier front', I wonder if it might be better to say '...reach glacier front'?

Agreed and this has been rewritten.