Revision summary

This manuscript has been reviewed by three reviewers. We have addressed all their comments and our replies have previously been uploaded to the online discussion. Here follows a brief summary of how the manuscript has been revised considering all the reviewers' comments as well as point-by-point how their questions were addressed. In part this is just a reiteration of what we uploaded online.

The revised version of the manuscript uses the term "Bering Land Bridge" consistently, which also implied a title change of the manuscript to "Post-glacial flooding of the Bering Land Bridge dated to 11 cal ka BP based on new geophysical and sediment records". Referees #1 and #2 both raised concerns regarding how the age model was described, specifically the effect of assigning different reservoir corrections. To clearly show the sensitivity of assigning different ΔR values for the age of the flooding of Bering Land Bridge, we included scenarios with ΔR=300 and 500 years in a specific figure. When replying to Referee #2, we suggested to include this figure as Fig 3C, but we now have decided that it is better to include as a self-standing supplementary figure in our final revision. This exercise provided the following median ages for the Bering Strait flooding: about 11.1 cal ka for ΔR =50 years, 10.8 cal ka for ΔR =300 years, 10.5 cal ka for ΔR =500 years. We believe this clearly illustrates the effects of applying different ΔR. It is emphasized that assigning larger ΔR yields younger ages for the flooding. The specific comments by Referees #1 and #2 are previously addressed in the separate detailed replies.

Detailed point-by-point replies to Referee #1 comments:

We appreciate the positive and insightful comments by Prof. Julie Brigham-Grette. We follow the suggested revisions as specified in detail below.

1. Regarding the use of Beringia and the Beringia Land Bridge. We can see that we made several distinct errors and have not been strict with the terminology, mainly because we did not pay enough attention to how the two terms have been used in literature. In the revision, we will use "Bering Land Bridge" consistently. The title will therefore be revised to include "Bering Land Bridge" rather than "Beringia Land Bridge".

   Furthermore, the following sentences will be included in the introduction to avoid confusion: "The term Beringia has later been used to include the entire stretch from the MacKenzie River in Canada to the Kolyma River in northeast Siberia. Here we use the term Bering Land Bridge for the specific subaerial connection that formed during lower sea level and permitting crossing Bering Strait by foot." Following this, we exchanged "Beringia Land Bridge" to "Bering Land Bridge" throughout the paper.

2. (Page 3) Regarding the added error of post-glacial tectonic movements in estimation of the Bering Land Bridge, we acknowledge that tectonic movements in addition to those caused by isostatic readjustments may also play a role. While this is nothing we can quantify, we add "other tectonic movements" to the list of uncertainties on page two, line 5.

3. (Page 5) The age models and their dependence on reservoir corrections is a difficult subject. After considering the comments by all three reviewers, we have included the different scenarios using different ΔR values as stated above in the summary. This implied that a new self-standing supplementary figure is included in the revised version of the manuscript.

4. We did not make it clear in the introduction of the discussion that the first cultures that inhabited North America likely travelled by boat, and were pre-Clovis. This is now included with a reference.
5. We previously stated that we would add Sedimentation rate curves in Figure 7. However, with the new supplementary figures, this should no longer be needed.

All the other minor points will be included in the revised manuscript, we thank the reviewer for the careful and constructive review and for spotting server inconsistencies, such as that we made some errors regarding the core name.

Detailed point-by-point replies to Referee #2 comments:

1. We note that we have omitted sedimentological/lithological descriptions of the two included sediment cores as pointed out by Referee #2. In the revised manuscript this is now included in Section "3.2 Sediment stratigraphy. Brief descriptions of the lithostratigraphies are added for each core before their sediment physical properties are presented.

2. More information about the age model construction, specifically regarding the adopted reservoir ages and their implications for the result is asked for in one way or another by all Referees. This has been handled as stated above in the summary, and with the addition of the supplementary figure showing how different ΔR values would influence the results.

The specific comments below raised by Referee #2 call for the following minor revisions

3.2. Figure 3 is already mentioned in Section "2.5 Dating", so is appears before Figure 4.
3.2. We do state the sub-division between Unit B1 and B2 is based on both magnetics susceptibility and bulk density. However, by switching the order they are mentioned, we emphasize that the change in magnetic susceptibility is more prominent.
3.3. We had previously said in our first reply to Referee #2 that we added the new panel C to Figure 3, however, this is now instead taken care of by the new supplementary figure as described in the revision summary.

We thank Referee # for noting the mistake we made regarding the sentence: "… just below the increase in both density and p-wave velocity". This is now changed to " just below the upward decrease in both density and p-wave velocity".

We removed the word "gradual" from the sentence describing the changes in $\delta^{13}C_{org}$ and bSi as suggested.

In the revised manuscript we will add some more discussion regarding the potential of a hiatus and what it implies. Finally, we said that we will add where R5 is located in figure 6A. However, we noted in the revision work that we better not since there is quite a bit of uncertainty around exactly where it is located. The resolution of the chirp data precluded a precise position in the core.

Detailed point-by-point replies to Referee #3 comments:

1. An introduction of the importance of section 3.1 is proposed:

First, we find that the detailed description is motivated by the critical importance of where the cores are placed in Herald Canyon in order to be able to record the history of Pacific water influx. In the revised version, we emphasize this importance by opening section 3.1 with:

"Herald Canyon topographically steers the western branch of Pacific water flowing into the Arctic Ocean (Pickart et al., 2010; Woodgate and Aagaard, 2005) implying that Cores 2-PC1 and 4-PC1 are strategically placed to record this critical component of the Arctic Ocean paleoceanography."

2. Referee #3 raised that there seem to be differences in timing between the shifts of different parameters. We present the various parameters in section 3.2 and with the added short description of the lithology, we hope that the relationships should be clearer. We believe that we emphasized that we picked the time for the transition in section 3.2. based on delta$^{13}C_{org}$ by stating:

"The transition in sedimentary regimes is based on delta$^{13}C_{org}$ occurring between 412 and 402 cm, thus closely similar to the observed change in sediment physical properties."

However, we agree with Referee #3 that we did not comment on that the parameter that does stick out is magnetic susceptibility. Therefore, we have added the following to the revised manuscript to underline that this is observed and not of significance for the timing of the first flooding event.

"Magnetic susceptibility generally follows the bulk density trend although with greater internal variability down core and a major shift from higher to lower susceptibility occurring at about 40 cm up-core from where bulk density changes, i.e. the susceptibility change occurs within the upper section of the core characterized by lower delta$^{13}C_{org}$ values."

3. On line 25-26 we write "the opening may have well boosted primary production and enhanced the productivity of higher trophic organisms for instance along the American west coast".

This was a pure error, it should of course be "North American east cost". This is changed in the revised manuscript.

4. Referee #3 raise that we should look for evidence for changing AMOC and higher productivity as an effect of our new timing of the flooding of the Bering Strait at about 11 ka BP. This is perhaps the only point raised by Referee #3 we disagree with as we do not find it appropriate to expand the manuscript by looking further for data that may show some changes that could be related to the opening of Bering Strait. Instead we have raised these points as questions, and hope it inspires the community to place observations/results in the context of a new timing of the flooding of Bering Strait. We prefer to keep the focus on the event itself.

5. Some more recent references regarding sea level data should be included (e.g. Abdul et al 2016, paleoceanography).

We had simply missed this important study, which naturally must be referenced. We have added both the reference and data to figure 2, and in addition, we include the following sentences at the end of the discussion:

"In the most recent sea-level reconstruction by Abdul et al. (2016) based on Barbados reef crest coral Acropora palmata, MWP1b is seen as a 14 ± 2 m sea-level rise, reaching a rise of 40 mm yr^{-1}, beginning 11.45 ka BP and ending at 11.1 ka BP."

In order to account for the comments by Bard et al. (2016), we continue with:

"However, it should be noted that this result has been questioned because the Barbados sea-level record may have been affected by local tectonic movements throughout the Late Glacial period and the living depth of the coral A. palmata may not be able to capture rapid sea-level rises accurately (Bard et al., 2016). However, if there was a rapid sea-level rise associated with MWP1b it fits well in time with our age estimate of the post-glacial flooding of Bering Land Bridge and a subsequent re-establishment of a Bering Strait throughflow, which in turn may have affected the AMOC by causing a greater amount of fresher water being exported out of the Arctic Ocean. "

6. Referee #3 raises that the relationship between the two studied cores should be made clearer and that the age model, including different reservoir ages should be further discussed.

The addition of more information on the two sediment cores' lithostratigraphies implies that we also illustrate further how the cores hangs together. The age model and the effect of different reservoir ages has been addressed already in responses to the two additional referees. We have included the new supplementary figure and accompanying text as described above in the revision summary.

7. We follow the recommendation and open the discussion of the seismic stratigraphy with:

"The seismic stratigraphy provides the broader spatial context of the two studied cores and helps us to use the results of the detailed core studies when addressing the post-glacial development of the Bering Strait region."

8. Referee #3 suggest that on page 9, the discussion of age constraints (line 19-20) should be moved below the discussion of the geochemical changes, i.e., before the last sentence of this paragraph.

We prefer to keep the location since we already revised this part and we find that it sets the scene well for the continued discussion.

Detailed editorial comments mainly concerning the figures

We prefer not changing the order of the figures since this will complicate how we revised the manuscript also considering the comments by Referees' #1 and #2.

An age depth plot for the critical part of the cores is now included in the Supplementary Figure 1.

Figure 4: Revised as suggested, directional arrow is added. The last sentence in the caption is also removed as suggested.

Figure 6: Labels A and B are included. We prefer to keep the overlay of the core data as it provides information. Resample is changed to resampled.

Figure 8. We disagree on this point and prefer to keep it as the last figure.

P2, L 21. Fixed and changed to 10,300 and core names are no consistent
P4, L. 31. Based on standard measurements the δ^{13}Corg values were analysed with an error of +/- 0.1‰. This was added to the manuscript text.
P.6, L9-12: No, the ARDEM is simply a very course model and based on spares data in comparison to our survey lines.
P.7, L. 7: Fixed
P.7, L. 8-9: Fixed
P. 7, L. 10: Fixed
P. 7, L. 17-18: Checked, but assumed to be fixed during publication
P. 7, L. 30: We mean higher, which has been added
P. 9, L. 22: Both actually.
P. 11, L. 23: New wording " Furthermore, the opening of Bering Strait provides a transport route of Pacific surface water to the North Atlantic through the Arctic Ocean with potential implications for the ecosystem"