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Interactive comment on "Central Arctic Ocean paleoceanography from ∼ 50 ka to present, on the basis of ostracode faunal assemblages from SWERUS 2014 expedition" *by* Laura Gemery et al.

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Interactive comment on "Central Arctic Ocean paleoceanography from âĹij 50 ka to present, on the basis of ostracode faunal assemblages from SWERUS 2014 expedition" by Laura Gemery et al. Anonymous Referee #3 Received and published: 22 June 2017

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The paper by Gemery and colleagues represents an interesting study that illustrates how the analysis of ostracod fauna can shed new light on the paleoceanographic

changes occurred in the central Arctic Ocean during the Late Quaternary (ca. the last 50 ka). This study can be particularly welcomed by teams involved in the reconstruction of recent past sea-ice conditions and relative strength of Atlantic Water influx to the Arctic Ocean during periods of climate variations. The Authors also put into question the possibility to use peaks in ostracod species (i.e. Rabilimis mirabilis) commonly recorded at shallow water-depths (<200m) as proxy for abrupt changes in paleoceanographic conditions. In my opinion, the most interesting elements of the paper are (i) the potential paleoceanographic significance of R. mirabilis migration events, (ii) the comparison among relatively high-resolution ostracod data from several cores and (iii) the effort to reconstruct a robust chronological framework for the 2 studied cores (32-GC and 32-MC). However, there are some aspects, concerning the interpretation of ostracod data and text organization, that could be improved:

1. I have the impression that the paper, in its present state, doesn't fully emphasize all the new results derived by the analysis of ostracode fauna (cores 32-GC and 32-MC). In particular, the discussion section (section 5.) only focuses on the distribution of R. mirabilis, while it should also include the reconstruction of paleoceanographic conditions from ca. 50 ka to present (according to the scope and title of the paper), emphasizing the novelty in respect to previous studies undertaken in the same area (e.g.,higher sampling resolution). On the other hand, results concerning R. mirabilis distribution patterns are poorly described in section 4. Moreover, I suggest to describe in more detail the stratigraphic/temporal patterns of ostracod indicator species from the 2 new cores (section 4.2) and more clearly distinguish data interpretation from the discussion and conclusions, based on the comparision among several cores. Authors' reply: We thank the reviewer for this thoughtful and helpful review. Yes, we agree that a restructuring was in order. We find it is more streamlined to present the results of the faunal patterns along with a discussion of their significance so we combined the Results/Discussion section into one and also added a new section (4.6 New faunal events) that presents R. mirabilis migration events and our interpretation.

2. The ostracod zones could be a little bit refined, highlighting the occurrence of a "transitional" ostracod fauna zone, between ca. 42-35 ka, dominated by Polycope spp., but also characterized by remarkable percentages of A. arcticum and Krithe spp.. I think that the ostracod data (Fig. 3) show interesting faunal turnover that could be investigated in depth using a statistical approach. Did the Authors perform multivariate analysis (e.g., DCA) to improve the identification of the main faunal turnover through the core succession/time and the comprehension of the main controlling parameters? Moreover, it could be useful a more detailed explanation of the main turnover in terms of paleoenvironmental conditions: what do the two peaks in P. caudata (between ca. 35-30 ka and 20-12 ka) mean? I also wonder why the percentages of A. arcticum are higher during the mid-late Holocene in respect to the LGM. Authors' reply: We followed Poirier et al., 2012 faunal zonation, as these zones are well established throughout the Arctic Ocean and in the SWERUS 32 cores. Yes, statistical analyses have already been done to establish the ecological relationships of the indicator species with environmental conditions (Gemery et al., 2013; Cronin et al., 1995). We do not interpret P. caudata, but record its frequency. Cronin et al 2014 report that based on P. caudata's co-occurrence with A. arcticum in modern and downcore samples, the benthic species appears to be ecologically linked to the surface conditions (also Cronin et al 2014, Fig 6). Percentages of A. arcticum are higher in the mid-late Holocene than the LGM because sea ice during the glacial at this location may have been too thick to allow light penetration under the ice.

3. The Authors state that the R. mirabilis peaks are composed by in-situ populations because of the presence of well-preserved adult and juvanile valves. I agree with the Authors that this is a good autochthonity indicator, however I wonder if there are other data that can support this interpretation and/or other analyses can be performed to exclude the possibility of resedimentation events. Authors' reply: We feel confident stating that R.mirabilis events represent in-situ populations because of the number and excellent preservation of the specimens. While there is the possibility of resedimentation, we do not see any signs of the shells being reworked.

4. In Mendeleev Ridge area, the visual inspection of ostracod data seems to show a low degree of correlation among cores. Maybe, it could be useful to compare cores ostracod data (Figs. 4, 5) using statistical methods. How much the ostracod patterns are really similar as stated by the Authors (e.g., in the abstract "Comparisons with faunal records from other cores from the Mendeleev and Lomonosov Ridges suggest generally similar patterns, . . .")? Authors' reply: Central Arctic Ocean ostracode faunal patterns documented in publications during the last 20 years (i.e. Cronin et al., 1995) show Cytheropteron spp., Henryhowella asperrima, and Krithe spp. dominate assemblages during the Holocene interglacial period (MIS 1) and interstadial events, while Polycope spp. dominates the glacial period (MIS 2) and stadial events. There are different proportions of these dominant species due to influence of deeper water masses, location, depth of the particular core examined. For example H. asperrima is not found in 32MC/GC but is found in other Lomonsov Ridge cores at deeper depths.

5. The construction of the age-depth model for the 2 new cores deserves a more detailed explaination and discussion. In particular, I'd like to see how ostacod data help to depth align the 2 cores. Authors' reply: To correlate cores 32-MC and 32-GC and produce a composite faunal record, we used patterns in ostracode assemblage in both cores, which led to a 3-cm offset for core 32-GC. It was obvious when comparing the initial depth-abundance plots of 32-MC and 32-GC that the faunal patterns would align if we added 3cm to the GC. After adding the 3-cm offset to sample depths of 32-GC, we applied the 32-MC core chronology down to 31.5 cm core depth (dated at 39.6 ka).

Minor comments: a) Cytheropteron spp. should be added in the abstract along with the other ostracod indicator species. Authors' reply: The Cytheropteron genus includes several deep-water species that are difficult to interpret so we are only including this group in a general way. Generally, the dominance of Krithe and Cytheropteron may signify seasonally open ocean conditions, possibly with deep-water convection as is found in parts of the modern Norwegian-Greenland Seas (Cronin et al., 2013).

b) In the introduction, I suggest to more clearly state the aims of the paper and highlight the novelty of this study in respect to previous works dealing with ostracod fauna from nearby cores. Authors' reply: We added a few sentences in to the introduction referring to previous foundational work.

c) An entire sub-section (5.1.) focused on foraminiferal fauna events is a little bit too much for a paper dealing with ostracodfauna. Authors' reply: We agree, we removed this section.

d) Paleoenvironmental changes documented by ostacodfauna should be reported in conclusions. Authors' reply: We restated the Conclusion section to summarize the general faunal patterns

e) Figure 3: please replace Krithe sp. with Krithe spp. Authors' reply: We only found Krithe hunti in the 32MC and GC cores, but in other cores from the central Arctic, Krithe minima was also found. So for this paper, Krithe sp. refers to Krithe hunti.

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2017-22/cp-2017-22-AC5-supplement.pdf

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