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Discussions

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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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The manuscript by Gemery et al. addresses an important topic, that of the ocean and climate change in the Arctic during the Quaternary. The new data from the SWERUS core 32 add useful information on the stratigraphy of ostracods over the last 40,000 years in the Arctic Ocean. The study core is one of the rare relatively well-dated sequence from the central Arctic Ocean, at least for the last 35 kyr and relatively high sedimentation rates (∼ 1 cm/kyr on average) permit to report the stratigraphical distribution of microfossils with millennial time resolution.

The new results from core 32 are very interesting. They are used together with the

data from many other cores (most being already published) to present an Arctic Ocean wide synthesis for the last ∼ 40 kyr. This offers a very valuable contribution as announced in the title and summarized in the abstract. In the manuscript, however, other data encompassing longer time scales, ranging up to the 160 kyr or even 340 kyrs, are discussed with reference to occurrence peaks of Rabimilis mirabilis in the ostracode assemblages. Hence, the scope of the paper is not clear. There is a hiatus between the abstract summarizing the new data from the SWERUS core 32 data and the discussion dealing with the longer time scales. In my opinion, the new data unquestionably deserve publication after a few points is clarified. The comparison with other records encompassing the last 40 kyr is very interesting and could be much useful especially if the basin-scale results are discussed in a more comprehensive manner. The synthesis part on the longer time scales, however, seems to be another story, which would require a better presentation/demonstration of the chronostratigraphy (including uncertainties) before to offer a robust scientific contribution.

My recommendation is therefore to revise the manuscript by focusing on the new data and their implication in term of large-scale paleoceanography at the scale of the last 40 kyrs. The manuscript will then offer an original, robust and useful contribution providing that some clarification/modification are made with regard to (a) the chronology and (b) the absolute abundance of ostracodes. (a) The age-depth relationship in cores 32MC and 32G was derived from linear interpolation between 14C dates as shown in figure 2. However, other solutions with highly variable sedimentation rates are very likely in the Arctic Ocean context. In particular, no accumulation or extremely low sedimentation rates during the last glacial maximum are recorded at many sites of the central Arctic Ocean (e.g., Norgaard-Pedersen et al. 2003; Polyak 2004; Not & Hillaire-Marcel 2010; hanslik et al. 2010). Hence, the age of ca. 20 ka in core 32MC can simply result from mixing. The use of a Bayesian approach (e.g., with the Bacon software for depth/age modelling; Blaauw & Christen, 2011) would be appropriate and could help constraining the uncertainties. Another concern comes for the old 14C ages (> 40 ka) that must be considered with caution because of potential biases due to even extremely small con-

tamination (e.g., Hughen 2007), notably through diagenetic processes and carbonate recrystallisation (Sivan et al., 2002; Douka et al., 2010). Thus, the chronology of the lower part of the sequence, older than about 35 kyr, is equivocal because the absolute age as well as the linear interpolation can be questioned. A critical presentation of the age-depth relationships in the other cores from the Lomonosov and Mendeleev ridges (Figures 4 and 5) would be useful to give an information on the time window represented by the samples analyses, to strengthen the regional zonation proposed and to clearly demonstrate the synchroneity or time lags in the records.

(b) The results are presented in term of number of ostracod counted and percentages of main taxa. The concentration or density of ostracode valves per unit of weight (g) or unit of volume (cc) would be very useful to describe the real abundance of ostracod in sediment and to get a picture of the actual fluxes of the key species. Moreover, Rabimilis mirabilis is discussed as an important species, but its downcore distribution is not shown in figures 3-5. It should be added (% and concentration) in the diagrams of these figures.

Beyond clarification in the presentation of results, some discussion about the actual significance of the ostracodes in the sediment would be helpful, as briefly suggested below.

1. In the interpretative schemes of the result section, the ostracode assemblages are associated with water masses, some of Atlantic origin. Are the ostracodes indicative of actual conditions in bottom waters or to transport with water masses ?

2. Acetabulostoma arcticum is associated with multi-year sea-ice cover, which makes it a very important bio-indicator, actually the only one that can be used to assess "positively" on the occurrence of perennial sea ice as far as I know. The fact that it characterizes the postglacial on the Lomonosov Ridge is important, but its low occurrence during the glacial interval is equivocal. Can it relate to low general productivity due to too thick perennial ice ? Its low occurrence on the Mendeleev Ridge for most the study

interval is also intriguing.

3. Rabimilis mirabilis is mentioned as a shallow water taxon. Could it be transported from the shelf (with sea ice for ex.) ? The fact that both adult and juvenal specimens are recovered (lines 361-364) is not a very convincing argument.

4. The zonation from the Lomonosov Ridge seems relatively robust, but Krithe spp. and Pseudocythere caudata show somewhat different records in the study cores. How can the difference be interpreted ? Does the deeper location of core AOS94-28 matter ? Similar, the assemblages from the Mendeleev Ridge show differences notably with regard to Krithe spp. Pseudocythere caudata. Are the differences indicative of a regionalism ?

5. High abundance/dominance of Polycope spp. characterizes the pre-Holocene sediment of almost all cores (Figures 3-5). This is interesting as it might indicate uniform water masses from Atlantic origin in intermediate layers of the Arctic Ocean during glacial time.

Other minor comments :

- The supplementary tables are not easy to read and there are parts missing. Probably there was a problem when saving them as pdf.

- The nomenclature of cores in figures 4 and 5 is not exactly the same than in the map of figure 1, which is a little confusing.

- In figure 5, the spacing of data points from core HLY6 is so large that comparison with other cores is not very useful ; Linking the data points between ∼12 ka and ∼27 ka for core AOS94 8, and between ∼ 13 ka and 40 ka for core AOS94 12 is inappropriate.