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Climate of the Past Discussions

Interactive comment on "Detailed insight into Arctic climatic variability during MIS 11 at Lake El'gygytgyn, NE Russia" *by* H. Vogel et al.

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We would like to thank both reviewers for their high quality reviews and valuable suggestions that will help improving our manuscript.

We would like to make use of the open discussion option and briefly respond to the major suggestions and comments raised by the reviewers here. Major suggestions and comments along with minor corrections and suggestions by the reviewers will also be addressed in the revised version of the manuscript.

Response to comments by Reviewer 2 (D. Raynaud)

Reviewer comment: Melles et al. interpreted a first MIS11 climatic record from El'gygytgyn and compared it with MIS 1 and MIS5. The main MIS 11 findings and

interpretations presented in the Melles paper should be summarized in the introduction of the Vogel et al. paper in order to highlight the added value of the new data. For instance, what is the added value of the new data when addressing the comparison with the Baikal record or supporting the teleconnection between southern and northern high latitudes as one of the main feedback leading to a super interglacial MIS 11 in the Arctic?

Author response: We will add a more detailed summary of the Melles et al. (2012) study in our introduction

As outlined by D. Raynaud, the manuscript presented here is aimed at providing a more detail insight into climatic and environmental change at Lake El'gygytgyn during MIS11c compared to the Melles et al. (2012, Science) article, which had its focus on Interglacial comparisons for the last 2.8 Ma. We use previously published (Melles et al. 2012) pollen data, pollen-based climate reconstructions, and Mn/Fe datasets along with a suite of additional, previously unpublished datasets (high-resolution BSi and TOC concentrations, TOC/TN ratio, Ti intensities, lithological core descriptions, color linescans) for our analysis of climatic and environmental changes during the respective period. We have chosen an approach that is based on a detailed sedimentological evaluation and multiproxy analysis. The detailed sedimentological approach chosen (1) in most cases supports the general pattern of the quantitative climate reconstruction as presented in Melles et al. (2012) but also (2) allows us to image climatic and environmental changes in a much higher temporal resolution. For instance our highly resolved (2,5 mm) BSi concentration record (a sensitive recorder of biomass production at Lake El'gygytgyn) appears to be primarily controlled by temperature and thus correlates well with the pollen-inferred T-reconstructions and other globally distributed climate records (marine, ice, lake) during MIS11c but also during the rest of the Quaternary.

We added a comparison with the Lake Baikal record and other globally distributed records in order to highlight common patterns and differences between the records. The discussion of possible teleconnections is in our opinion improved through the de-

tailed evaluation of the Lake El'gygytgyn sediment record by the highly resoluted additional proxies. However, as also stressed by reviewer 1, the discussion of possible teleconnections is hampered by the often large errors of the different age models and thus in some cases rather of speculative nature. In the revised version of the MS we will improve the discussion.

Reviewer comment: Chronologies and age models. This is a critical issue when comparing the E'lgygytgyn record with other paleorecords, and even more in the case of a relatively short period like the MIS12/MIS11 transition and MIS11 duration. This is for instance important when looking at Figures 3 or 4 and I strongly suggest to highlight in the figure caption the fact that the respective chronologies used make a direct correlation of the observed events rather speculative. If I am not mistaken, the paper give only temporal resolution for the composite core but I did not find indications of dating uncertainties (p. 6314, lines 15 to 22). This is a required information. The paper in section 5 compares the El'gygytgyn record with other records in a global context. The different age models used can be critical when discussing MIS 11 issues. Is that discussed somewhere a part from saying in the conclusion that correlation of specific swings is hampered because of the large errors of the different age models?

Author response: We agree with D. Raynaud and will add a more detailed discussion on age model errors in the revised version of the manuscript and also add this information in the respective figure captions.

Reviewer comment: Duration of MIS 11. This is a complex question, which, for instance, is currently debated in a PAGES group devoted to the Past Interglacials. Apart from the chronological uncertainties mentioned above, the major difficulty is likely to assess when an interglacial period starts and ends. In the case of the multiproxy approach used at lake El'gygytgyn, the problem is maybe even worse depending of the proxy we consider. Nevertheless I agree that at El'gygytgyn, like in some (a few?) other globally distributed sites, MIS 11 has a long duration compared to the following (younger) interglacials. Is the duration 27 or 25 or 30, that's another problem and I don't

think we can be more precise at this stage of the knowledge and taking into account the different uncertainties.

Author response: We fully agree with D. Raynaud on the point that a precise assessment of the duration of MIS11c is hampered by the lacking precision of the age model. Based on the proposed age model error of c. 4kyr for the respective time interval (Nowaczyk et al. this issue) we can only assume a duration of 'interglacial conditions' at Lake El'gygytgyn of c. 27 +/- 4kyr (min. 23kyr, max. 31kyr), which is close to the time span suggested by other records. We will add a more thorough discussion on this topic in the revised version of the manuscript.

Reviewer comment: Following the reviewer #1, I will recommend to reduce the speculative interpretations either because of the significance of the proxies (but again it's not my expertise) or because of the uncertainties linked with the age models. At least evaluation of uncertainties should be provided.

Author response: We will reduce the speculative interpretations and add a more thorough discussion of issues related to age model uncertainties.

Reviewer comment: To consider the warm event around 425ka and the following cooling as a possible expression of a B/A-YD-like climatic oscillation looks to me as an example of speculative interpretation, which could lead to biased conclusions. It would require higher resolution measurements of the basic MTWM and PANN proxies to have a more precise information about the oscillation (about its duration,..). Why such oscillation could not be considered also as occurring at the beginning of the MIS11 interglacial? The same type of MIS 11 oscillation observed in the EDC Antarctic ice core can be seen as analogous of the Antarctic Cold Reversal, as well as it can be seen as similar to the dip at about 8ka that occurred after the early Holocene warm period (EPICA community members, 2004). We should note that the choice is not trivial because it has an impact at least when estimating the duration of the interglacial.

Author response: We agree with the fact that postulating similarities with the observed

climate oscillation at the beginning of MIS11c with the B/A-YD oscillation requires at least a better temporal control to make it less speculative. The fact that we see this oscillation not only in the MTWM and PANN but also in other high-resolution climate proxies shows, however, that this oscillation must have had a significant impact on the environment around the lake. Similar patterns observed in records from Lake Baikal, the N-Atlantic and Antarctic ice cores simply made it too tempting to postulate an analogue for this oscillation. We will revise the text and the figures and may rename the swing to colder climates at Lake El'gygytgyn to 'early MIS11c cold reversal'.

Interactive comment on Clim. Past Discuss., 8, 6309, 2012.