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Climate of the Past Discussions

Interactive comment on "Dynamic diatom response to changing climate 0–1.2 Ma at Lake El'gygytgyn, far east Russian Arctic" *by* J. A. Snyder et al.

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We appreciate the suggestions of both referees (Cremer and anonymous) and the opportunity to integrate our research more thoroughly with the expanding contributions of El'gygytgyn drilling research community. The following paragraphs respond to the specific points mentioned in the reviews.

Cremer 1/2 – Omission of Figs 4-6. These figures provide 5x higher sampling resolution than Fig 2. To make them more useful, additional climate proxy data have been included in these higher resolution plots, and more comparison details are included in the discussion.

Cremer 3 – Scaling of diatom concentrations. Revised figures are scaled with equal low values. The original scaling ranges were selected to illustrate the variation within species occurring at lower peak numerical concentrations. For example, the genus Pliocaenicus, although never achieving numerical concentrations of Cyclotella at its peak, may reflect comparable silica and biomass because of its size.

Cremer 4 – Diatom accumulation rates. We acquired available density data (Gebhardt et al., 2013), and calculated mass accumulation rate using the age model. From mass accumulation rate, diatom accumulation rates were calculated for each sample. Some of these calculations are added to the text, especially the sections comparing diatom production in MIS 1 and 2 and characterizing low diatom accumulation zones. However, we decided to maintain the unaltered diatom concentrations in the main figures, to emphasize the independent interpretation of the diatoms and to avoid noise or artifacts produced primarily by the age model.

Cremer 5/6 – Table with species in plankton diversity index, updated taxa list. We clarified the text explaining the contributions to the plankton diversity index. We agree that more complete taxonomic descriptions/lists, and observations of ultrastructural variations over the long history of the lake and their interpretation are an important area of research. These ongoing studies, including extensive use of scanning electron microscopy, will be included in forthcoming publications in an appropriate venue. Observed sparse periphytic Fragilariaceae are not included in the Fragilaria plots.

Cremer 7 – Plankton size. We agree that this is an interesting topic, and this lake provides an opportunity to explore further the factors influencing plankton size. We report here our preliminary observations. Detailed analyses require systematic downcore measurements in the context of other taxonomic observations (see comment 5/6). These data are presently being collected and analyzed by a graduate student.

Cremer 8 – Selection of intervals. These intervals were chosen to correspond to exceptional interglacial events highlighted in Melles et al. (2012). Guided by the overarching

objective of the science team, several of the initial core studies have focused on these intervals (D'Anjou et al., 2012; Lozhkin and Anderson, 2013; Vogel et al., 2012), and some of these submissions have begun to cite the higher resolution diatom data in our discussion paper.

Cremer 9/11/12 – Zones of low plankton abundance/re-emergence, "unique" taxa. We expand the discussion of absence and re-development of taxa after low diatom abundance. We have also clarified the threshold used to identify such events, including calculated accumulation rates. The term unique in reference to Pliocaenicus seczkinae, was used to mean not reported to occur elsewhere, acknowledging the greater uncertainty in its geographic range in previous times. This point is clarified in the revised discussion. Ultimately, these questions of uniqueness and adaptation will be best addressed by detailed taxonomic studies spanning the entire history of the lake (see comments 5/6, and 7).

Cremer 10 – "Unexpected" diatom response in MIS 2. We have revised the text and removed the term "unexpected," acknowledging the general potential for cold productive environments. The original intent was to highlight the complexity of the lake's response to apparently cold climate events, as indicated by numerous proxies. Since the first submission of the manuscript, Holland et al. (2012) also explore this interval using biomarkers. We have included comparisons with these studies in our revised discussion.

Cremer 13 – Conclusions. This section has been re-named and re-written to emphasize future studies.

Anonymous – The anonymous reviewer further emphasized the general need for improving the linkages to climate. Several of the responses to Cremer also address this issue (see above). We agree that additional systematical data, for example periphyton assemblage, preservation, size, etc., may improve these linkages. We hope that the initial results presented here complement the more rapidly generated proxy data

and provide guidance for ongoing and future in-depth diatom studies. The specific text comments are appreciated and addressed in the revised manuscript.

Interactive comment on Clim. Past Discuss., 8, 4601, 2012.