

Interactive comment on “Pliocene to Pleistocene climate and environmental history of Lake El’gygytgyn, Far East Russian Arctic, based on high-resolution inorganic geochemistry data” by V. Wennrich et al.

P. Fawcett (Referee)

fawcett@unm.edu

Received and published: 7 February 2014

Pliocene to Pleistocene climate and environmental history of Lake El’gygytgyn, Far East Russian Arctic, base on high-resolution inorganic geochemistry data

General Comments

This manuscript describes the paleoclimatic history of Lake El’gygytgyn using geochemical analysis via scanning XRF as the primary proxy analyzed. By analyzing a few critical elements and elemental ratios, the authors document downcore variations

C3369

in lake productivity, changes in detrital input to the lake (and possibly catchment weathering changes), and variations in lake bottom redox conditions which are related to ice cover, lake depth, and bottom current conditions. Given the long timeframe of the Lake El’gygytgyn core (Pliocene to recent), the authors are able to document significant changes in climate from the Pliocene to the modern, including documentation of the onset of northern hemisphere glacial cycles and then the familiar change in the dominant orbital frequency from 41 ka to 100 ka across the mid-Pleistocene transition. The authors also provide additional evidence for the already documented super-interglacials in the Lake E core, although the elemental ratios used for this do not only occur during these extraordinary warm events. The paper is comprehensive, well written and organized (with some minor English errors), and will be of great interest to the paleoclimate community. In sum, this is an impressive study that is well worth publishing in *Climates of the Past*.

Specific Comments

In the abstract, both TOC and TN values increase after 1.6 Ma in response to more intense glacial cycles. How is this relationship thought to work? (A sentence or two in the abstract would be helpful related to perennial ice cover and bottom anoxia.)

The exceptionally warm interglacials (e.g. MIS 11c, MIS 31 etc.) are documented by extreme Si/Ti values (along with lows in other elements) and correspond to previously documented super-interglacials (e.g. Melles et al., 2012). However, there are additional interglacials such as MIS 9 where peak Si/Ti values are as high as during the documented super-interglacials but are not labeled as such. (There are a few other examples – one at ca. 2.6 Ma and possibly MIS 17). The manuscript should include some explanation of why these additional intervals of high Si/Ti and/or low values in K, Ti etc. are not also considered to be super-interglacials.

The elemental abundance and ratio data are presented in their entirety in three figures (figs 3-5), which have a rather small format. Some of the main features are evident in

C3370

this presentation; however, a lot of detail is lost as more than 3 million years of high resolution data are compressed into a small space. Is there any other way to format the figures (additional panels etc.) that would help to better convey this information? For example, it is hard to see the change from 41k glacial cycles to 100 ka cycles given the timescale.

In the discussion, there is a vague explanation for changes seen at 1.8 Ma (e.g. p. 5920). While I understand the cooling of the Beringian landmass, it is not clear what you mean by a drop in ocean-land moisture transport. Do you mean less precipitation? If so, what is the postulated mechanism that relates to oceanographic changes reported at this time?

Technical Comments

In many places in the text, the word “supposed” is used in the context of “is thought to” – I would replace the former with the latter as it removes confusion with the verb “supposed to”. Alternatively, the term “hypothesized” could be used in place of “supposed”.

p. 5902, line 26. “whose results reacts highly sensitive” does not make sense – rephrase this. (i.e whose results are highly sensitive). . .

p. 5905, lines 13 and 16 use “were” instead of “where”

p. 5905, line 27: use “enables non-destructive measurement of. . .”

p. 5907, line 10-11: use “The mathematical model was tuned . . .”

p. 5907, line 10: use “The total carbon and total inorganic carbon contents. . .”

p. 5907, line 19. When you say “postulated age of the crater”, isn’t this precisely known? (It appears to be given the small error associated with the age.) Why not just say the “age of the crater”.

p. 5909, line 12: Assigned might be better to use than attributed (in terms of facies).

C3371

p. 5909, line 20: Here, use “attributed” in place of “addressed”.

p. 5911, line 22: “supposed to cause a lacking grain-size dependency. . .” is awkward – try rephrasing.

Line 25: use “rather steadily decreases” in place of “rather constantly decreases”

p. 5911: Here you give several XRF counts that will not be very meaningful to most readers. Why not describe the trends more qualitatively?

p. 5915, line 28: Use “preferentially” in place of preferably.

p. 5917, line 14: Use “seen” instead of “visible”.

Line 23: Do you mean “the signal is masked by detrital dilution”? With the “hardly masked” usage, this is confusing. p. 5920, line 1: Use “related to” in place of “addressed to”.

p. 5920, line 26: What is the “MS” referred to here? Is it magnetic susceptibility? If so, define more completely.

Interactive comment on Clim. Past Discuss., 9, 5899, 2013.

C3372