

## ***Interactive comment on “Long term trends in aquatic diversity, productivity and stability: a 15,800 year multidecadal diatom study from Lake Baikal, southern Siberia” by Anson W. Mackay et al.***

### **Anonymous Referee #1**

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General Comments: This is an interesting investigation of the relationships among diatom diversity, diatom productivity (biovolume), and climate stability during the deglaciation and Holocene in Lake Baikal, a lake with limited human influence over this period. The question of how biotic communities responded to climate change or climate variability – in other words their resilience – is of broad interest, particularly given the high-latitude location of the lake and the substantive climate variability on these time scales. The data are of high quality, and the interpretations of trends and relationships are generally well supported. As elaborated below, I suggest only a rela-

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tively small number of changes to clarify specific issues or to amplify interpretations.

Specific Comments:

Study site: In the description of the lake, it would be helpful to say something about the primary producers. Specifically, what proportion of the primary producers are diatoms, and how is diatom productivity related to overall primary productivity? What are the primary controls on diatom or primary productivity in the modern lake?

Lines 376-78: It's not clear why you focus only on half of the Holocene Bond Events – why not the intervening ones? If there is a diatom response only to the few Bond Events that you chose here, but not the others, this is worthy of a comment or speculation about why this might be so. Also, these dates are different from those originally proposed by Bond (e.g. he has 5.9 and 4.2 ka, whereas you list 5.2ka) – are these recalibrated? Please clarify.

Line 395-7: So what does it tell us about the environment or about the diatom community if the community has high species richness but low N2 diatom diversity?

Line 400: I'm confused. I thought lines 383-384 say the pre BA community has moderately high species richness, but here you say the flora persists with low richness. Please clarify.

Lines 401-402: Would it make more sense to only consider planktic diatom species richness and diversity? Or also include diversity changes simply among the planktic group? Changes in diversity that are a result of mixing of littoral with planktic communities (taphonomic processes) that didn't really live together is very different from changes of diversity within a single community of species that are actively interacting and competing for resources.

Line 420-422: This raises the general issue about how changes in seasonality might affect diversity, especially given that the diversity of a sample is integrating over multiple decades. If you simply lengthened or shortened the summer season, what would

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happen to diversity? I'd like to see a bit more development in the manuscript about the impact of seasonality on diversity, etc.

Line 467-482: I don't think this description of what occurred globally is needed – stick to the global driver (AMOC) and the regional manifestation of climate that drove aquatic change.

Conclusions: I wonder about adding a few thoughts or speculations about how these observations of patterns in Lake Baikal might compare with paleolimnological observations/reconstructions made in other regions or from other kinds of systems about diatom resilience to natural climate variability (for example, Jovanovska et al. 2016; Benito et al. 2019). There have been a few recent papers out on this. This would emphasize the broader significance of the results.

Technical comments:

Line 322, 331: Northern Hemisphere is a formal and specific geographic place – I was taught it should be capitalized (but maybe that is a US English thing?).

Line 447: replace “are” with “is”

Lines 540, 541: in both lines a “)” is missing

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