

Clim. Past Discuss., referee comment RC1
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Comment on cp-2021-56

Saija Saarni (Referee)

Referee comment on "Seasonal climate signals preserved in biochemical varves: insights from novel high-resolution sediment scanning techniques" by Paul D. Zander et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-56-RC1>, 2021

General comments

The manuscript by Zander et al. presents high-resolution geochemical records from biochemical varve sequence of Lake Zabinskie. The topic is very interesting and timely. The use of biogenic content as climatic proxy is underrepresented among varve studies, nearly missing, due to their more complex nature compared to for example clastic varves or minerogenic content of mixed varves. Exploring biochemical content of varved sediments provide new insights to climate studies and new opportunities for high-resolution climate reconstructions, not only for new locations but also for different seasons. Zander et al. use state-of-the-art methods and present high quality data with comprehensive statistical analyses. The manuscript is well written and the figures and tables are of high quality. The interpretations are logical and justified by data. I have only few minor comments to improve the manuscript and one technical issue related to manuscript structure.

Specific comments

Line 98 How many researchers calculated varves

Line 190 How about cultural S? If excluded in Lake Zabinskie, shortly comment. In addition, it seems from supplementary Figure 2 that varve characteristics change at 1965 where the analyses of this paper begins. It is out of the topic to discuss older sediments, but could you very briefly mention the reason for the change (anthropogenic?), so that reader would understand where the record starts, from what conditions related to

anthropogenic activities. If known. With this background information, reader would have a better perspective on local conditions and hence easier to evaluate the data related to the elements sensitive to anthropogenic activities.

Line 214 "High values of Ti denote the ice-covered period, when mainly fine lithogenic detrital material is deposited." Could you please briefly specify the process? Usually ice cover reduces sedimentation by reducing clastic material transport from the catchment and also protecting littoral sediments from waver activity and resuspension.

Line 252 Could you please specify how? This is less carefully explained compared to other three varve types.

Line 316 ITRAX beam width 20mm?

Figure 3 B: It would be nice to have years represented by each varve in addition to the information of the sediment depth. Can you add calendar years of each varve like you show them in fig 3A?

Technical corrections

There is two discussion chapters in the manuscript: chapter 3 "results and discussion" and chapter 4 "discussion". This should be revised and structure clarified, by either having results and discussion at the same chapter or remove discussive parts from current "results and discussion" section and present them in chapter 4 in discussion. In my opinion both ways would work here.