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Discussions

Interactive comment on "Late holocene trends of phytoplankton productivity and anoxia as inferred from diatom and geochemical proxies in Lake Victoria, Eastern Africa" *by* M. Andama et al.

Anonymous Referee #1

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The recent ecosystem degradation of Lake Victoria has stimulated research regarding the role of anthropogenic activities vs natural changes. Changes in nutrient inputs and climate-related stability in the lake have each influenced productivity and anoxic conditions in the past. The paper by Anadama et al. builds on our existing knowledge of the various drivers behind deep water anoxia in Lake Victoria. Anadama et al present an argument that primary productivity and deep water anoxia are correlated at some points in time and not correlated at other times, over the past 1800 years.

The paper is well-written but the data provided are not extensive enough alone, without additional context and/or data to add substantially and convincingly to our existing knowledge. The single sediment core was taken a bay within Lake Victoria, and there

is no discussion as to whether conditions in this bay are representative of those within the larger lake. The authors use diatoms as an indicator of productivity, but it is not clear whether diatoms are consistently the dominant group of phytoplankton or if other types of phytoplankton are potentially more abundant as certain times (such as when the diatom and anoxia records do not correspond).

In general, there is some over-interpretation of the results, and more detailed comparison to other studies would be helpful. Because there is so little variation in diatom counts and Fe/Mn ratio within the core, it is difficult to make any strong statements about lake conditions, and I think the author's interpretations extend beyond what can be conservatively based on the data. Most of the statements regarding productivity are based on the diatoms record, and there is really very little change in the diatom record and it is not clear that diatoms are representative of productivity. The changes in the Fe/Mn record are slight. The four zones delineated in the core data seem wishful thinking – personally I see a trend within the core towards more diatom and higher Fe/Mn ratios, without distinct zones.

The use of the Fe/Mn ratio as an indicator of anoxia is a good geochemical tool (are the ratios in mass or molar?). Other geochemical indicators, such as total phosphorus would also have helped clarify the status of nutrient limitation in the lake – diatoms tend to be limited by phosphorus and silica rather than by nitrogen. Changes in Total Nitrogen may actually have greater impact on other algal groups, such as cyanobacteria. Light availability may also be limiting to phytoplankton, and increased turbidity could also be a factor in phytoplankton abundance (such as was found in a recent paper by Giuma-Njuru et al. 2013. Strong spatial differentiation of N and P deficiency, primary productivity and community composition between Nyanza Gulf and Lake Victoria and the implications for nutrient management. Freshwater Biology 58:2237-2252).

Technical comments. Total Nitrogen is shown in Figure 3, but there is no information about these data in the methods. Diatoms were identified to genus, but there is no presentation nor discussion of these data. While this information could provide additional

insights into lake conditions, my guess is that the counts are just so low overall, that changes in composition are not necessarily significant.

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