

Interactive comment on “Holocene phototrophic community and anoxia dynamics in meromictic Lake Jaczno (NE Poland) using high-resolution hyperspectral imaging and HPLC data” by Stamatina Makri et al.

Anonymous Referee #1

Received and published: 8 November 2020

Manuscript number: bg-2020-362 Title: Holocene phototrophic community and anoxia dynamics in meromictic Lake Jaczno (NE Poland) using high-resolution hyperspectral imaging and HPLC data

Makri et al present a very detailed record of variations in phytoplankton community composition and associated changes in redox conditions of a Polish lake. This lake has already been studied thoroughly in previous publications. However, the authors present new data together with these published records to make a very nice comparison of pigments and trace element records. Very elegant is the combination of high-

C1

resolution techniques to reconstruct short fluctuations in environmental conditions that the lake experienced with traditional techniques that provide high compound specificity, though at the expense of the high temporal resolution. The combination of these techniques provides large insight into the changes in water column conditions and species composition during the lake's history. This manuscript is suitable for Biogeosciences after consideration of mostly minor comments as outlined below.

Title: redox dynamics

Line 15: altered mixing regimes – what does that mean? Is this aspect related to hypoxia or any other reasons? I guess the main problem with changed mixing regime is the change from a well-mixed system to meromixis? Please clarify.

Line 19: change sentence so that you state pigment analysis using two different techniques. While one method enables high spatial resolution pigment analysis (though only raw data), the HPLC data allow high compound specificity. This should be better explained here.

Line 43: The Diaz and Rosenberg papers about Hypoxia would be important references to cite here.

Line 73: Total chlorophylls or only Chlorophyll-a and derivatives considered here? Including Chlorophyll-b and c? Please clarify.

Line 84: Related to my comment above. Please reformulate to low-resolution pigment record using HPLC analysis with high compound specificity, which cannot be achieved by the hyperspectral record.

Line 90: Remove sentence 'This is rare in Europe.' This sentence is not useful.

Line 99: Remove Butz et al. in brackets, because it is noted twice.

Line 157: Are bacteriopheophytin a and b both detected and distinguished by hyperspectral and HPLC techniques? It would be better to separate the records of both

C2

compounds to establish if species-composition changes in the sedimentary record of the lake need to be considered for the reconstructions, because both compounds are not necessarily produced in the same quantities from the same species.

Line 160: Are bacteriochlorophyll c, d and e present as well? If so, are they reconstructed by the HPLC technique? This also shows that the different bacteriochlorophylls and their pheophytins should be distinguished throughout the manuscript instead of using Bphe as abbreviation for the sum of these compounds.

Line 183: blue–green algae are also cyanobacteria. Please distinguish which forms of cyanobacteria can be reconstructed by these two pigments or are these indicators widespread in all cyanobacteria?

Line 186: Pheophorbide a is considered as indicator of grazing – Please add reference to support this. It is a derivative of chlorophyll like other derivatives and can also simply form by degradation/structural alteration, which is not limited to grazing.

Line 233: Unclear why the age uncertainty is high in the varved part of the sedimentary record. These are annual layers, so age determination should be up to a few years only? How to explain this?

Line 331: The chronology is robust and exclusively based on terrestrial macrofossils – Related comment to the previous comment. Why is there no higher precision in the age record of the upper part of the record as it is varved? Other radiometric dating techniques that are useful, such as ²¹⁰Pb dating? The high uncertainty of about 140 years indicates that the age model appears less robust than it is expected to be due to the presence of varves?

Line 481: The data should be uploaded to PANGAEA now so the link to the datasets can be included into the final version of the paper.

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