First of all, we are very grateful for the in-depth evaluation and constructive feedback on our manuscript. We appreciate the time and detail that both reviewers took which included screening of the associated manuscripts from the Ohrid group.

We are aware that the Lake Ohrid dataset and interpretation of the proxies is not complete at the present stage but we are convinced that this manuscript will provide a valuable contribution to better understand the terrestrial environmental and lacustrine conditions in Lake Ohrid. The revision is currently underway and will greatly benefit from the suggestions by the reviewers.

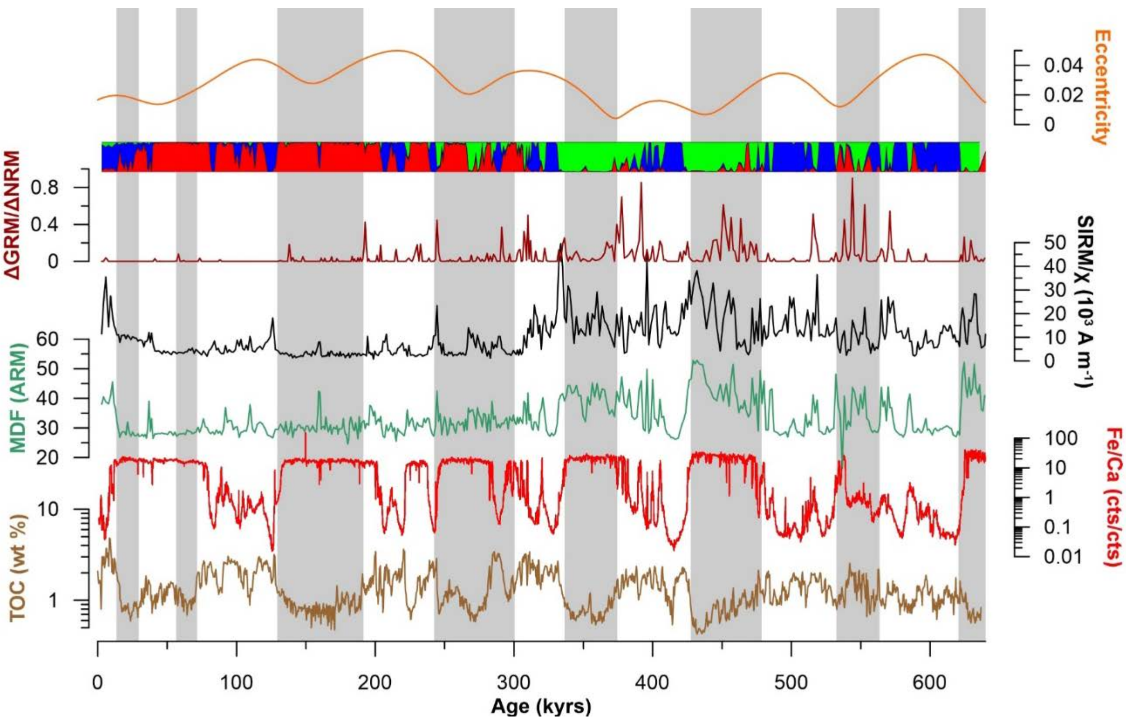
Primary comments: The most obvious feature in the data is the large contrast between Unit 1 and Unit 2. This appears in all proxies, and seems linked to changes in the abundance of greigite (accepting the authors' arguments) and the grain size of magnetite. Despite the prominence of the Unit1/Unit 2 shift, after reading the paper it is not at all clear what causes this transition. Page 14228 line 15 indicates that Unit 2 is "overprinted by neo-formation of magnetic minerals", which would suggest that the authors interpret this transition to reflect down diagenesis. Some of the most prominent features of the Unit 1/Unit 2 boundary are the appearance of greigite in Unit 2, but the interpretation of this as "overprinting" is difficult to reconcile with the interpretation advanced in the paper of syndepositional formation of greigite. Moreover, the transition appears quite sharp, and it is not clear how "overprinting" explains the various changes between the different Units. The authors should present a clear explanation for this transition- could changes in sediment or water sources (via tectonics or similar processes) have altered the supply of sulfur to the lake? Or are there other possibilities to explain the variations?

#1
Thank you for these suggestions, we will clarify the division into the two units more clearly.
We consider it unlikely that this boundary corresponds to a diagenetic front, responsible for the differences in the magnetic properties, because the Fe-sulfides that we observe in the lower unit have formed relatively rapidly after deposition. See also reply #4.

Moreover, not only the magnetic but also geochemical parameters indicate a shift in lake conditions, i.e., interglacials in unit 2 have much higher TIC concentrations (see Francke et al.). This can be related to water chemistry, leading to a better conservation of carbonate, or to a higher endogenic carbonate precipitation. Since TOC, which is also regarded as a proxy for lacustrine productivity but is also influenced by decomposition, is comparably (to TIC) low, this rather suggests a better ventilation (organic matter degradation) and/or changes in lake water chemistry thus a high production of carbonate. However, the TIC/TOC pattern concerns the interglacials and greigite concentrations concern the glacials, meaning that there is a fundamental shift in lake conditions integrating all over Unit 2.
At the moment we assume that the Lake Ohrid basin was less deep at those times (subsidence is still ongoing). However, it is still puzzling why the boundary is that sharp, and hopefully ongoing work on seismic data will reveal evidence if tectonic movements can be responsible for this. See also reply #4.

The two proxies for greigite abundance, SIRM/K and GRM/NRM, are not entirely consistent during Unit 2, as discussed on page 14223. The authors conclude that SIRM/K is a more reliable proxy for greigite, but do not explain why. Please explain. Related to this, if SIRM/K is in fact the most reliable proxy for greigite, this somewhat weakens the authors' arguments that increased greigite is climatically controlled. GRM/NRM shows very strong glacial/interglacial relationships. SIRM/K shows much weaker signals- values are higher in interglacials MIS 13 and 15 than in MIS 14, for example, and there are strong peaks at the beginning of interglacials MIS 11 and 9. What explains these patterns?

#2
We extended the analyses of the magnetic parameters, and produced various cross-plots and included the MDF into our evaluation. Together with the downcore plots it can be observed that highest SIRM/k values are observed when GRM is low, while MDF is still relatively high (i.e. > 30 mT). We performed SEM on magnetic extracts of samples that either are characterized by high SIRM/k and zero GRM and lower SIRM/k and high GRM. We found that the samples that have zero GRM but a high SIRM/k contain large nodules of Fe-sulfides (up to some tens of microns) while samples that have more moderate SIRM/k and high GRM contain microcrystalline greigite. We therefore assume that the maximum SIRM/k values occur when the authigenically formed Fe-sulfides grew coarser than the SD/MD threshold. In those cases GRM is zero, because only SD greigites acquire significant GRM. The observation that GRM samples are mainly located at glacial transitions (i.e., eccentricity minima) also argues for a climatic control on the greigite formation. We can only hypothesize that in the course of the cooling within a glacial, the nodules grew to bigger size. Additionally, at the transitions mentioned above, SIRM/k drops at the moment were TOC reaches maximum values. See also reply to reviewer 1.



Line 3, p. 14225. The authors interpret Figure 4C to indicate oxidation of reduced Fe minerals such as pyrite) to magnetite during sample heating of a sample of glacial-age sediment in Unit 1. They then use various calculations of the magnetic properties to show that that the magnetic properties are more indicative of oxidizing than reducing conditions. This interpretation seems robust, except that it does not explain the behavior of the sample in Figure 4C. Can the authors provide an interpretation of these data? It would be very helpful to the authors' argument if high-temperature susceptibility measurements were made on sediments in Unit 2 that they infer do NOT have greigite, to show that they changes they observe are in fact due to greigite and not other high coercivity iron phases.

#3
As suggested, we performed additional high-temperature measurements on samples that are inferred to contain or lack greigite. Except the two samples from the uppermost Holocene section, that were already presented in the paper, all samples show an increase in susceptibility above 400°C and higher susceptibilities in the cooling branch. This behavior is not only typical for oxidation of pyrite, but also observed for Fe-bearing clay minerals. The strong contribution of paramagnetic minerals (including clay) is also conveyed by the non-correlating downcore susceptibility and SIRM curves. Consequently, the heating-cooling susceptibility measurements cannot be used to reveal the presence of Fe-sulfides. Accordingly the sentence that pyrite is present all over this section will be modified.

Line 26-28, p. 14227. The authors suggest that low eccentricity in some "stronger" glacials, such as MIS 10, 12, and 16, drove low primary productivity and TOC accumulation via cooler summer conditions. However, the %TOC data are not incredibly clear on this issue- %TOC appears similar in MIS8 to MIS 10. Moreover, all glacials appear to have %TOC values less than 1%, so I question whether a few tenths of a percent difference in TOC contents is strong enough to drive the inferred changes. Are there other possible explanations?

#4
Thank you for this comment. We agree that the slightly lower TOC concentration in those glacials are not solely responsible for the preservation and formation of greigite between those glacials. Based on the two reviewer comments and together with the revision and reviewer comments on related papers from the special issue, we will re-evaluate the interpretation of extremely cold glacials in Unit 2, which contains significant greigite.
We are convinced that a distinct shift in lake conditions occurred. An alternative to the observation that those glacials were extremely cold, a rise in lake level or changes in hydrology and chemistry could be responsible for the observed shift.
1) Tectonics/Subsidence
2) Changes in water exchange between Lake Ohrid and Lake Prespa

3) Changes in water outflow from Lake Ohrid

At the present state, we cannot conclude which of those processes is important, and an evaluation needs additional investigations, including hydroacoustics and biological studies (e.g., shifts in communities), which have at this stage not been carried out down to the corresponding depth.

However, within this lower interval greigite is only present within glacial sediments. For this glacial-interglacial pattern, the process of a better ventilation of Lake Ohrid during glacials, and therefore increased aerobic degradation compared to anaerobic degradation (increase in sulfur reduction) is valid. At least if the greigite formed as an early-diagenetic phase (see also reply to reviewer 2).

Technical comments: Line 18, abstract: delete the comma.
Main text Line 3, p. 14217. It is not just magnetotactic bacteria that do this. Fe-reducing bacteria can induce the formation of extracellular magnetite simply by reducing iron.
Text will be edited

Line 21-30, p. 14218. It is not really clear how the spatial distribution of elemental concentrations links to the downcore variations in elements from these lines. I suggest deleting lines 23-25, which introduces the confusion.
Will be deleted/rephrased.
Line 11, p. 14219. Does XRF-Fe mean X-ray fluorescence intensities of iron? If so, state so. If not, delete the “Fe”.
Will be edited.

Line 4, p. 14222. Delete “basically”
Will be edited if still valid after paper revision.

Line 15, p. 14220. Francke et al. also provide %carbonate data. Please briefly (a few words) state how TIC, TOC, and TS were measured.
Will be included.

Line 15, p. 14227. What is the evidence that Fe sulfides such as pyrite are present in interglacial sediments?
We actually didn´t find any evidence for pyrite. While the magnetic extraction, delivered surprisingly high amounts of paramagnetic siderite and some vivianite, pyrite was not contained. We will revise this part of the text.

Line 10, p. 14229. Fine-grained titano-magnetite is likely a small proportion of the terrigenous inputs, not the “main” component. Rephrase.
Will be rephrased.

Figure 1. I suggest including an inset that shows the location of Lake Ohrid within Europe, for readers not familiar with the location and eastern Mediterranean geography.
Will do.