

Revision 2

General Comments:

This manuscript provides a very thorough analysis of sediment cores from two lakes in eastern Africa, a region that is highly susceptible to the adverse impacts of a changing climate as well as a region with sparse paleo data coverage. By combining multiple age models, XRF data, geochemical and microscopic analyses with satellite data and seismic imagery, they have produced interesting and important results.

There are a few things that should be done to strengthen this manuscript: performing the same analyses on all of the core sections so that we can directly compare the cores (e.g. Figures 4 & 5) and a reorganization to reduce the length of the manuscript and improve readability.

Given the importance of understanding this region and its sensitivities to regional and global climate, these revisions are well worth the time invested. I encourage you to revisit this manuscript. I look forward to seeing a revised version soon.

Answer: Following the reviewer-2 suggestions, the text of the manuscript has been reorganised and significantly shorten. Concerning the comparison data comment, please refers to the following answers here below (“Results” comment).

Specific Comments:

Line 27 - what is meant by “still suffers from ENSO climate teleconnection” – maybe something like “is impacted by ENSO climate teleconnections” is better?

Answer: The sentence has been clarified.

Line 35 - ~700 years? The paper seems like it would be better to focus on the last ~50 years when you have the most data.

Answer: The integration of both sequences enables us to examine hydro-sedimentary trends spanning approximately 700 years. However, the comprehensive datasets and enhanced temporal resolution obtained from the AFA18-02 sequence afford us the opportunity to narrow the primary scientific focus of the paper to the last 50 years.

Line 43 – the units of these products is probably not necessary here.

Answer: Units has been removed.

Results – there are differences in the way that the cores were treated/analyzed. Is it possible to do all of the same analyses on all of the sections of cores?

Answer: The sedimentary description system for the Afambo and Gemer Lake cores has been tailored to suit the characteristics of the respective investigated deposits. In the case of AFA18-02, there is a discernible pattern of alternating sedimentary layers throughout the core. Conversely, GEM-18-03-04B exhibits a consistent sedimentary pattern throughout its length, with the exception of a pedogenized layer observed between 20 and 40 cm at the top of the sequence.

Given the absence of repeated similar layers in the sediments of Gemer Lake, the adoption of a Facies system description was deemed unnecessary, as predominantly only one facies was represented. Consequently, we found it necessary to utilize the sedimentary facies system description for AFA18-02, while it was deemed unnecessary for GEM-18-03-04B. This decision was informed by the contrasting sedimentary patterns observed in the two lake deposits, which are extensively discussed in the manuscript.

Given the absence of discernible sedimentary patterns observable to the naked eye, as well as a lack of textural (grain size) differentiation along the GEM-18-03-04B core, it was not feasible to establish a facies system for this deposit. Consequently, we opted to employ geochemical tools to delineate the sedimentary phases within the Lake Gemeri deposits. This approach proved to be successful in elucidating the linkages to changes in the lake surface over time.

There are a lot of great things in this paper but it is quite long. Are there some methods or results details that could be streamlined? Do these same processes apply to the modern times as well as the last ~700 years?

Answer: The text of the manuscript has been significantly reduced (4000 characters = ~2 pages)

Figure 8 is very helpful for understanding a complex area – would it make sense to present it in the introduction as you are introducing the region?

Answer: Fig. 8 is an interpretative illustration. Consequently, has been maintained into the Discussion section.

Section 5.4 is really interesting and well-done. As you work to shorten and consolidate the text, this is an important piece to keep. These ideas, to me, are the big takeaways from this article!

Answer: A shorting text operation has been provided.

The climate story back to 1300 CE seems a bit of an afterthought. Is it worth keeping in this manuscript?

Answer: Due to the intricacies of the age model and the uniformity of sedimentary processes observed in the GEM18-03/-04 sequence, a comprehensive discussion of the period spanning from 1300 CE to 1960 was not feasible. Therefore, the paper's emphasis is placed on the last 50 years, where the high-resolution age model and hydro-sedimentary interpretations are firmly established. However, given the significance of the extensive record in an often overlooked region, we maintain that publishing the entirety of the data is warranted.

Technical Corrections:

Abstract line 40 – I question whether hydraulic is the right word here.

Answer: the world has been replaced by water.

Line 64 – “source of moisture fluxes from Atlantic or Indian Oceans”- this phrase seems out of place or missing a word or two.

Answer: The sentence has been clarified.

Paragraph starting with line 89 – this should be a “wrap up” the introduction paragraph and much of it is. There are some new ideas presented here (human impacts, for example) that should either be removed or moved to another paragraph in the introduction and explored more fully.

Answer: Introduction section has been reworked, and the “human impacts” sentence has been removed from this section.

Figure 1B – what is DEM?

Answer: “Digital Elevation Model” meaning has been added in the caption.

Line 241 – please specify the short-lived radionuclides. I assume ^{210}Pb , ^{226}Ra and ^{137}Cs but it would be helpful to know which ones you are using.

Answer: short-lived radionuclides has been precised at the beginning of the paragraph.

Figure 1 uses A, B, C and Figure 2 uses a, b, c – either is fine but need to be consistent

Answer: Figure mentions has been homogenised.

Table 1 – Column 1 should be Depth

Answer: Depths has been added in the column 1.

Line 324 – There is a “0” instead of “O” in SiO₂ (also line 367)

Answer: Corrected.

Table 2 – there are a lot of rejected ages. Could this be improved? If not, please provide further discussion of why these ages were rejected or eliminate this part of the age model.

Answer: The discussion about the rejected ages has been improved in the text.

Figure 4 – Since you do not have Cs data prior to 1982, it is hard to know what the peak in Cs was.

Answer: the ¹³⁷Cs peak is lower than the base of the core as we also observed an increase of ¹³⁷Cs activities downward.

Line 414 – ²¹⁰Pb – the ex needs to be subscript

Answer: corrected.

Line 534 and 545 – subscripts for CaCO₃ and ²¹⁰Pb_{ex}

Answer: corrected.

Line 619 – chronicle?

Answer: corrected.

Line 626 – D90 or Q90? Both are used in the text and figures. Which do you want to use?

Answer: the unit nomenclature has been homogenised with D90.

Line 691 – the monsoon season should be referenced a bit more in the introduction. This is an important aspect of the climate system in this region.

Answer: Few sentence of monsoon season has been added in the introduction.

Line 693 – are anomalous low and reduced rainy seasons different things or the same thing said twice?

Answer: The sentence has been clarified and deplaced into the introduction section.

Line 779 – define IOD

Answer: IOD acronym has been defined.