

Interactive comment on “46 000 years of alternating wet and dry phases on decadal to orbital timescales in the cradle of modern humans: the Chew Bahir project, southern Ethiopia” by V. Foerster et al.

Anonymous Referee #2

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Foerster et al. present a XRF record of inferred past climatic shifts in Ethiopia, using sediment cores collected from the Chew Bahir basin. This paper appears to be an extension of the work published in Quaternary International in 2012, in which XRF data from core CB-01 was presented. Much of the text is devoted to an extensive discussion of the geology and the sedimentology of Chew Bahir, which at the outset suggests that this manuscript would be more appropriate for a sedimentological journal rather than Climate of the Past.

General comments:

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I agree with the other Reviewer that the millennial and centennial-scale interpretations in this manuscript are suspect. While the Younger Dryas is clearly evident, the Heinrich Events and D/O are not, in spite of what the authors claim. I am not convinced that the small changes in XRF-based K or Cl measurements can be reliably interpreted as climatic; they are not consistent across the three cores, and therefore seem to be no more than proxy noise.

Even on the broader scale of glacial-interglacial changes in climate, there are a number of questionable and/or vague interpretations in the manuscript. The authors state that the termination of the AHP is gradual, but it appears to me quite obviously that the data suggest that it is abrupt, especially in core CB-03. Even in core CB-01, the transition occurs faster than might be expected from orbital forcing (cf. Fig. 6). The mechanism that the authors invoke to explain the transition involves an interplay of seasonal insolation curves, yet insolation can in no way explain the abruptness; some sort of feedback mechanism must be involved. The authors need to clarify and address this important issue.

Finally, the writing style of this manuscript seems casual for a scientific paper (e.g., ...”responsible for that.”, Line 16, p. 996; beginning sentences with “So”, Line 6, p. 1004) and needs grammatical editing (e.g., Line 19, ...”he sedimentary composition and the partially overprinted elemental record during lake-phases indicate.”)

Overall, my recommendation is that this manuscript is not suitable for *Climate of the Past*. This is partly because the subject matter is not solely focused on climate – much of the focus of the manuscript is on the sedimentology – but also because I do not find all of the climatic interpretations defensible.

Specific comments:

-Cl appears to be interpreted as something that derives from an allochthonous source, in response to an increase in chemical weathering. From which rocks does the Cl derive? Is it possible that some of the Cl reflects changing lake salinity?

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Line 18 p. 998: I'm not quite convinced that insolation during October and November could be responsible for the persistence of the AHP, nor that the lakes respond only to JJA insolation. It certainly cannot explain why the termination of the AHP was abrupt in some locations and not gradual. First of all, there is some evidence that lake levels declined abruptly at 5 ka (e.g., Lake Turkana; Garcin et al. 2012), so it is not true that lakes only respond to JJA. Secondly, the increase in ON insolation is accompanied by a decline in JJA; so if the climate responds straightforwardly then a gradual decline should still be observed. A feedback mechanism is needed to explain an abrupt transition, whether that be vegetation, oceanic feedbacks, or perhaps dust. See also Tierney & deMenocal (2013) for a discussion of possible feedback mechanisms for the East African region.

Line 1 p. 1000: In the Gulf of Aden leaf wax δD record (Tierney & deMenocal, 2013) as well as the Lake Tanganyika leaf wax record (Tierney et al., 2008) there is evidence for more humid conditions during this precessional cycle, and it is also clear that sedimentation rates increase at Chew Bahir, which would seem to suggest wetter conditions in spite of the XRF data.

Line 14 p. 1000: I doubt that the oscillations referred to by the authors are D/O events; I do not see in Fig. 7 that any of the rapid changes in the XRF data align with D/O events. I would not interpret these "rapid changes" as climatic; they seem to me to be just proxy noise.

Line 5 p. 1003: Here it is stated that the termination of the AHP is gradual, but it looks to me to be rather abrupt (Fig. 6), or at least, certainly faster than the orbital forcing would predict.

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