Clim. Past Discuss., 10, C218–C221, 2014
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Climate of the Past Discussions

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 #1

Received and published: 16 April 2014

The authors present high-resolution sedimentological and geochemical (mainly XRF) data from sediment successions cored along a transect through the presently desiccated floor of the Chew Bahir basin in southern Ethiopia. Major target of the study is the reconstruction of both long- and short-term changes in humidity and related depositional processes in the study area. The data provide extensive information on changes in depositional processes of the study area. On a large scale, the interpretation of hydrological changes in the catchment of the basin appears convincing, however, echoing the main conclusions already published by a similar group of authors in 2012 (Foerster

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et al. 2012, Quaternary International 274, 25-37). On shorter time scales, the interpretation appears less convincing. This is mainly due to the large errors in the age models, containing various outliers and scattering of results with deviations of several hundreds to even thousands of years from the mean values applied to generation of the age scale. In addition, the element distributions at the different sites show correspondence with respect to the long-term changes but significant differences and inconsistencies concerning millennial and centennial time scales. The reasons for the contrasting response of different parts of the lake basin to abrupt climate change remain unresolved.

The presented proxies for aridity (potassium) and humidity (chlorine) alone seem not suitable to understand the underlying environmental and depositional processes in the required detail. In the conclusions and outlook chapter (page 1004, line 15 following) the authors therefore state correctly, that their interpretations are still mostly hypothetical and that it would be necessary to improve and validate the understanding of provenance, weathering and transport mechanisms from source to the actual depositional sites of the cores. As a consequence, this study contains quite some over-interpretation, particularly concerning the nature of the more abrupt events and their connection with North Atlantic climate events.

As a consequence, the results of the new manuscript do not significantly add to the already existing knowledge of the study by Foerster et al. 2012. This paper presents data on core CB-01-2009, which is part of the data again shown in the new manuscript. The study of Foerster et al. 2012 mainly concentrates on the long-term environmental evolution of the Chew Bahir basin and its response to the orbital-scale hydrological evolution of the study area. In this process, existing data from adjacent tropical regions, such as the African and Asian monsoon systems and lake levels are shown for comparison. In the new manuscript, the age model is based on significantly more data, and additional records from adjacent sites are included. However, comparisons with stable isotope data from the Iberian margin and with nitrogen isotope data from the Indian Ocean (as shown in Fig. 7) appear not really useful since they address different

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processes. The main climatic conclusions clearly lack a significant improvement of the understanding of the underlying climatic and regional depositional processes.

More specific comments:

- Although mentioned in the title and abstract, I do not see a strong relation of your data and manuscript to the evolution or migration of modern humans since this is only superficially addressed in the manuscript.

- The manuscript contains some general information on the distribution of fossil remains in order to support the general conclusions drawn from the XRF data. In addition, Fig. 5 shows fossil remains and appears useful for illustration. However, no quantitative information on the distribution of organism remains is shown. Such information would have been very useful to better understand the underlying hydrological changes also with respect to more abrupt changes and potential ecological thresholds in the lake system. In addition, the ecological significance of the different organisms groups (e.g. diatoms) is not properly discussed and underpinned with references. For example, on page 994, lines 10-15, you do not cite any literature with respect to the inferred ecological preferences of certain diatom taxa.

- The figures appear much too busy. Many details of Fig. 1 are too small or even appear irrelevant for your study. The same holds true for Fig. 4, which includes too much of information and interpretation (e.g. arrows).

In summary, the manuscript contains a number of significant shortcomings. On short time scales, the records exhibit clear differences, suggesting that abrupt climate changes are not consequently reflected in the geochemical data shown, or that the environmental processes in the basin system are not yet understood. In addition, the documented scattering of the age dates impedes a solid interpretation of decadal to centennial or even millennial-scale variability. The significant overlap with the results and climatic interpretations published by Foerster et al. 2012 appears generally problematic and questions the novelty of the new manuscript. If the manuscript shall be

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published in “Climate of the Past” it will require substantial revision, significant shortening but a much more critical evaluation of the significance of the short-term signals documented in the different XRF-records. For example generation of a stacked record would erase some of the observed local short-term variability and would help to extract the more robust paleoenvironmental information.

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