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Climate of the Past Discussions

Interactive comment on "Sensitivity of the grassland-forest ecotone in East African open woodland savannah to historical rainfall variation" *by* I. Ssemmanda et al.

Anonymous Referee #1

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General comments

Ssemmanda et al. present a high-resolution vegetation reconstruction from Lake Chibwera (Uganda) based on pollen. They analyzed pollen at a sub-decadal resolution (mean sampling resolution of ∼8 years covering the last ∼250 years). Their study aims at testing the sensitivity of local vegetation (tropical lowland-grassland-forest ecotone) to historical changes in precipitation. To estimate past vegetation changes in the region Ssemmanda et al. combined downcore pollen data from Lake Chibwera with information derived from modern pollen (topcore) data of eight lakes located in the region. Modern sedimentary pollen allows evaluating the relationship between pollen assemblages and actual vegetation cover. Finally, they compared the vegetation in-

ferred from pollen during the last ∼250 years with regional climate data derived from historical information or instrumental monitoring and concluded that: “historical rainfall variation exerted modest effects on local tree cover”. Overall I found this paper interesting, well written, and clear. Since I am not a pollen specialist I cannot, however, comment on the exactitude of their pollen interpretations.

- One major weak point of this study is that it does not provide any quantitative reconstruction of vegetation and climate using for example a numerical approach based on the pollen dataset. As it is, this study remains classical, limited to the simple pollen description and interpretation. I would strongly recommend Ssemmanda et al. to go one step further. First, they may use the biomisation method to reconstruct potential biomes and vegetation succession stages during the last 250 years. Second, they may use modern analogues and artificial neural network technique to reconstruct climate parameters such as the mean annual precipitation. A good example of this workflow was presented by Lebamba et al. (Climate of the Past, 2012) for Central Tropical Africa. The comparison between pollen-reconstructed climate/vegetation parameters and observed climate/vegetation parameters would be more straightforward than it is currently presented. Since there are only few (if any) studies describing such high-resolution pollen record in tropical Africa, such a quantitative reconstruction would be highly valuable for this region.

- A second weak point is that Ssemmanda et al. claim to compare pollen-inferred vegetation with “historical rainfall variation”. However, nowhere in this paper, rainfall data are shown. The authors rather used lake-level as rainfall indicators, although lake-level integrate rainfall, evaporation, groundwater and stream input, and water output (groundwater and overflow). For comparison with their pollen data, I would rather suggest the authors to present and use the continuous rainfall records available since the 1890s in this region (GHCN data). They may also use the semi-quantitative precipitation fields over Africa, which date back to 1800 (see Nicholson et al., Quaternary Research 2012).

CPD
10, C491–C494, 2014

Specific comments

- To assess the timing and magnitude of the inferred vegetation changes with coincident precipitation changes, the authors suggest comparing Figs. 4 and 2. This is a difficult exercise. The time axis of one figure is horizontal while it is vertical for the other. I would suggest the authors to modify their figures in order to facilitate the comprehension of their data. Regional rainfall time-series (see above) should be added to the lake-level data shown in Fig. 2. A comprehensive comparison (in time, not depth) between the most representative pollen taxa (or group, cf. Fig. 4) and the climate data (cf. Fig. 2) should be made in a separate new figure.

-Page 1693, Ssemmanda et al. noted: "the exact timing of reconstructed vegetation changes appears somewhat delayed relative to the improving or deteriorating moisture balance which is likely to have caused them (compare Fig. 4 with Fig. 2). The discrepancy can be attributed partly to dating uncertainty in the Chibwera sediment record." The authors should also note that ecosystem responses to climatic/environmental disturbances are not always instantaneous. Vegetation replacement may lag climate variability. This kind of data should motivate Ssemmanda et al. to participate in the debate on how fast vegetation can respond to climate change (e.g. Hughen et al., Science 2004; Maslin et al., Science 2004; Science Jennerjahn et al., 2004).

- What is the lake catchment area of all the studied lake basins? This information should be added (e.g. as a table) with other size parameters to evaluate the potential long-distance and short-distance sources of pollen.

- Photographs showing the local main biomes, which were sampled, would be very useful for the readers. For the non-pollen specialists it is difficult to evaluate how different is the vegetation across the studied sites (based on the percentage of pollen alone).

- The abstract should be shortened.

CPD
10, C491–C494, 2014

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