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Climate of the Past Discussions
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Interactive comment on "The effects of past climate variability on fire and vegetation in the cerrãdo savanna ecosystem of the Huanchaca Mesetta, Noel Kempff Mercado National Park, NE Bolivia" *by* S. Y. Maezumi et al.

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GENERAL COMMENTS

Maezumi et al. have provided a new empirical study of fire-vegetation processes in savanna, linked to climate change over a millennial-scale time period. In the interpretation of this detailed, multiproxy record, Maezumi et al. have provided an ecologically sound and nuanced interpretation of climate, fire and vegetation dynamics in an edaphically-controlled savannah, which has proven to be a challenging topic in trop-

ical palaeoecology. The discussion of 'orders of control' over the fire and vegetation regimes is thoughtful and well-considered, and the ecological importance of the study is discussed in the framework of modern conservation and management concerns. Maezumi et al. have demonstrated how a palaeoecological study can offer an important long-term perspective on globally-important savanna ecosystems. The scope of the study, how climate interacts with vegetation and fire in an edaphically-controlled ecosystem, should be of interest to a broad scientific audience interested in past climate change, and so, is suitable for publication in this journal.

Overall, the writing is fluent and very well structured, and the arguments are clearly made and well-referenced. The title is a little clunky and I would reconsider the depth of geographical detail provided here. I have a few suggestions/corrections to make with respect to the discussion and the presentation of the stable isotope data. My greatest concern is the zonation of the phytolith data (see 'Specific Comments'), which influences interpretation of key transition points. I would like to see that the zonation changed or my concerns addressed in a response from the authors.

SPECIFIC COMMENTS

2. Materials and Methods

2.2. Chronology: Please provide further details of the options adopted in the creation of the age-model in CLAM; for example, what options, such as the age estimations, were selected in the creation of the model? Does the grey shading in Figure 2 represent two-sigma error?

2.7. Phytoliths: Please clarify how the phytolith sums were calculated. i.e., were percentages of non-Mauritia phytoliths calculated on the basis of the total sum of phytoliths excluding Mauritia?

3. Results:

Zonation of phytolith data: There are several points about the zoning methodology that

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I find unclear and/or problematic. Firstly, it is stated that the zones were determined by constrained correspondence analysis (CCA), but the authors do not indicate what environmental variable constrained the analysis. It is possible that CONISS is meant here, given that a dendrogram is provided with the phytolith data. Secondly, if CONISS was the clustering method chosen to create the zones, the authors have not chosen the divisions that create the lowest dispersion within each cluster (often chosen by drawing a straight line at a given height of the hierarchical tree, see Grimm [1987]). From the dendrogram provided, and assuming that the authors intended that minimised dispersion was the goal of the zonation exercise, the order of the zonation divides should be as follows:

First order : boundary between zones 3 and 4, as is currently designated

Second order : within zone 4, around 2 kyr BP

Third order : boundary between zones 2 and 3, as is currently designated

The zone boundary between Zones 1 and 2 is of a lower order than further divisions within Zone 3 (ca. 4500 yrs BP) and Zone 4 (ca. 1800 yrs BP).

Finally, was the number of recognized zones determined by any statistical methods, such as a broken stick model?

Grimm, E.C. (1987) Computers and Geosciences, 13: 13-35

Zones 3.1 – 3.4:

The authors have presented a considered and nuanced interpretation of the climatic, ecological, edaphic and altitudinal controls on fire and vegetation on the mesetta. My only concern is the relative changes to fire frequency shown throughout the record. Although charcoal accumulation shows some fairly larges shifts, I question whether the range of 2-5 fire events per 1000 yrs is a significant shift in the palaeofire record? How does this compared to other sites in similar vegetation assemblages?

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Page 152, lines 1-2: Please rewrite. I find this sentence difficult to follow. Discussion:

Pg. 156, ca. ln 5: Give references for Late Glacial climate change.

Pg. 157, This is an excellent discussion of possible climate drivers of changes in Mauritia abundance. However, the estimated of the temperature increase reported in Whitney et al. (2011) is 19,500 yrs BP, not 15,900 yrs BP, as indicated in twice in this section. I'd also like to add that the vegetation shift reported in the Pantanal probably reflects a threshold response (such as the removal of regular frosts), so I support the authors' interpretation of potentially cooler temperatures in the Late Glacial, as explained by higher frequency surazos (Bush and Silman 2004), despite the erroneous citation.

Pg. 159, Ln 3: The insolation minimum occurred ca. 12,000 yrs BP, not in the mid-Holocene as indicated. Although increasing precipitation in the late Holocene has been linked to increasing insolation in the southern hemisphere during the austral summer, the opposite pattern does not hold true for the transition into the Holocene.

Pg. 162, Ln 22: Maize pollen was recovered from sediments dating to ca. AD 940 to AD 1700, not yrs BP as indicated, and only in L. Chaplin, not L. Bella Vista. Many apologies if the dates I provided were unclear. Please amend to 1000 to 400 cal yr BP.

Figures:

Figure 4. It would be helpful if you specified in the caption that the zones are derived from the phytolith data.

Figure 5. The stratigraphic presentation of stable isotope data makes it difficult for the reader to interpret the data, given they need to consider a combination of variables to determine the source of the carbon. I would like to see bivariate plots of stable isotope data (i.e., d13C v. C:N) to show the organic source matter. The zones can be displayed by using different plotting symbols for each zone (such as shown in Cordon et al. (2005), for an example).

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TECHNICAL CORRECTIONS

1.4 Vegetation:

Section 25: Many of those families are not true grasses, is ‘Monocot families’ meant here? Or perhaps, ‘Families of the order Poales’ is meant (with the exception of Orchidaceae).

Correct the spelling of Orchidaceae, Eriocaulaceae, and Rapateaceae.

References:

I haven’t checked through the citation list thoroughly, but I did notice the following were missing from the list:

Mittermeier et al. (2000) Perdue and Koprivnjak (2007) Smith et al. (1997)

Interactive comment on Clim. Past Discuss., 11, 135, 2015.