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Interactive Comment

Interactive comment on "Pollen-based biome reconstructions for Latin America at 0, 6000 and 18000 radiocarbon years" *by* R. Marchant et al.

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Pollen-based biome reconstructions for Latin America at 0, 6000 and 18 000 radiocarbon years. By R. Marchant et al, Clim. Past Discuss., 5, 369–461, 2009

General comments

This manuscript is an interesting contribution to the knowledge of past vegetation changes in Latin America, a wide area from where vegetation reconstructions had not been previously synthesized. It is a work that was being needed, after the successive publications of biome reconstructions in the different continents, and it addresses relevant scientific questions within the scope of CP. The authors apply the previously published biomisation method by Prentice et al. (1996a) to a number of pollen stud-





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ied sites in Latin America, covering different regions and different vegetation types, to obtain biome reconstructions for the present, 6000 BP, and 18 000 BP periods, which leads them to analyze the general vegetation and climate patterns of change throughout this time period.

The scientific methods used in this work have been widely accepted as valid, and applied to similar data in Europe, Africa, North America, Asia and Australia. They are now applied to a set of sites from Latin America, that have been previously published, and the authors of which are properly given credit. In general, the results support the interpretations and conclusions, the title reflects the contents of the paper, the overall presentation is well structured, and the language is fluent and precise. However, there are some comments that can be addressed, particularly referred to the overall presentation of the text, figures and tables, but also to the method used to select the appropriate pollen spectra representing a site at a given period, to the possibility of including a new figure to improve the observation of biome changes along and across the Andes, to the interpretation of Mexican sites, and to the existence of previously published biomisation work in northwestern Mexico, with a suitable pollen site that is not being considered. The manuscript needs to be revised following the specific comments and technical corrections that are developed below.

Specific comments

Methods, 385-3 to 9.

In the development of biomisation methods, the authors mention the problem that arises when multiple samples encompass the age boundaries, and have maximum affinity to different biomes. They assume that the "majority" biome is the best representative. I do not completely agree with this decision. I think that the evidence of a biome change should be considered as representative even if it was a single sample. I wonder if this may be the reason why the percentage of biome change at 6000 BP is lower than expected. Most particularly for 6000 BP, this is a time where a change is recorded in many sites, so it is probable to find different pollen spectra before and after

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the date. Depending on the resolution of the pollen study, on stratigraphical changes, sedimentation rate, and on the homogeneity of the sampling, a different number of samples may have been taken for the periods of 500 years before and after 6000 BP. If there were more samples representing the period after 6000 BP, most probably the resulting biome would be the same as the modern; however, there was a different biome at 6500 BP, which is evidenced by a fewer number of pollen spectra, maybe only one spectrum for this period, but which is supported by additional older than 6500 BP spectra.

Results, 386 - 17.

The authors explain that the results are not sufficiently clearly shown in the figures, owing to the abrupt altitudinal change in the Andes. Maybe another figure could complete the information concerning the altitudinal gradient. I suggest that a new figure could be drawn including altitudinal profiles corresponding to different latitudinal zones, 5 to 6 according to the main modern biome changes stated in Figure 2. Each of the 5 to 6 profiles could be similar to the cross sections in Figure 4, with additional colored dots along the profile, corresponding to the reconstructed biomes. In this way, observed and reconstructed biomes could be shown in a composite picture depicting different latitude fringes and different elevations.

It is very difficult otherwise to corroborate the interpretations with the available figures.

Results, 390 - 6.

The absence of biome change in the Mexican mountain sites may be related to edaphic factors, but I think it also could be considered that the sites that lay close to biome limits will experience deep vegetation changes in response to slight climate changes, while those sites located in a biome, and far from the boundaries of other biomes, may not record any change, if climate change is not strong enough. This is clearly shown for the Holocene in the work we have been carrying out in Northwestern Mexico (Ortega-Rosas, C.I., M.C. Penalba & J. Guiot, 2008. Holocene altitudinal shifts in vegetation belts and environmental changes in the Sierra Madre Occidental, northwestern Mexico,

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based on modern and fossil pollen data. Review of Palaeobotany and Palynology 151, 1-20). What is the altitudinal range of the warm mixed forest around the site?

Results and discussion.

Most of the discussion in the text refers to South America. This is obvious when we see the maps in Figures 7 to 9, with the dots referring to the sites: very few records correspond to Central America and Mexico. However, it would be interesting to link the results from this work with those of North America. In this respect, I think that it would be interesting to consider the existence of a pollen site in Northwestern Mexico showing the transition from cool conifer forest to warm mixed forest at 6000 BP (Ortega-Rosas, 2003, Palinología de la Ciénega de Camilo: datos para la historia de la vegetación y el clima del Holoceno medio y superior en el NW de la Sierra Madre Occidental, Sonora, México. National University of Mexico (UNAM), unpublished Master's thesis). Biomisation of this and other pollen sequences was published in Global and Planetary Change 61, 242-266 (Ortega-Rosas, C.I., J. Guiot, M.C. Peñalba & M.E. Ortiz-Acosta, 2008. Biomisation and quantitative climatic reconstructions techniques in northwestern Mexico – with an application to four Holocene pollen sequences.).

Considering all the text, there are many typing errors, as well as problems in the figures, tables, numbering of sections, references, which suggest that the manuscript needs to be checked thoroughly. I hope that there are not errors in the transcription of data; it would be a hard task to review them, but it would be necessary if there is any doubt.

Numbers of the sections:

For example, 1.1 but there is not 1.2; and 4.1 has no text, 4.2 is O.K., but then 4.2.1. which should be 4.3 (or 4.2).

References:

See the spelling of Spanish and French references, even in English (Absy, Almeida, Godínez, Islebe – Younger Drays –, Ledru, Lozano-García, Ortega-Guerrero, Xelhuantzi-López. Beware of the order of multiple references in the text, and order

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of the references in the list (chronological, and one/two/multiple authors), for instance Bush, Colinvaux, Marchant, and in the text 383-8.

PFT's names differ from figures to tables and text.

Organization of the text: Methods, 2.2. Biomisation

I think that the section could be organized in a different way: instead of presenting first biomes and then PFT's, it could be more logical to first describe the procedure to obtain the PFT's, then the biomes, first considering the available regional literature, and then that of other continents work.

The methodology used to choose the representative sample of a site for a particular time period should be explained in a different paragraph.

Results.

Try to make the text more fluent by organizing the different paragraphs according to the ideas they develop (different separation of paragraphs).

When describing the dots corresponding to modern biomes, it could be good to first show that the results are overall good (386 - 17), then comment that there are some results that are not so clear, and finally, some problems (try to explain some of the problems, even if they are considered somewhere else in the manuscript, e.g. 386 - 2 to 4). The first comments about Brazil and Argentina are difficult to see in the figures, and should be avoided unless explained otherwise (385 - 23 to 26). It is a good idea to first show the geographical context (386-387) and then detail it by biomes (388).

Figures and Tables.

Figure 1. Revise July ITCZ. It would be south to January ITCZ for Mexico.

Figure 2. Biomes for Northwestern Mexico do not reflect modern biomes (CGSS instead of TDF, TDF at the place of the Sonoran Desert.

Figure 3. Change photographies g/f, and see the text, twice j, k.

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Figure 4. Cross an altitudinal cross section.

Figure 5. Locations of range of sites.

Figure 6. Colon: types: tropical, ... Compare rain green tree / raingreen tree This latter PFT is not in the list in Table 2. PFT names in Fig. 6 and Table 2 must be coincident.

Figure 7. The colors in Figures 2 and 7 should be the same.

Better results could be obtained if the colored dots (reconstructed biomes of Fig. 7) where plotted on the modern biome map (Fig.2). The results would be better visualized. It is difficult to try to follow the text with the two different figures (2 and 7).

Table 1 and 3. Table 1 caption corresponds to Table 3 and viceversa.

Table 1. TDFO. Main locations, line 7, "rwithin ain shadow" Floristic char., line 2, "dparticularly rought". Read thoroughly all tables.

DESE. Main locations, eliminate "the former... Andes". CGSH Main locations. Tierre del Fuego (Tierra), see all the text CGSS cusion (cushion) plants

Table 2. Range of PFT's ... range Ds desert shrub (not shrubs) Tx in a range of moist environments

Table 3. indicating

Table 5. tf Alcemilla (Alchemilla?)

Txt Peperommia

Technical corrections

Abstract.

372, 18. Eliminate "also". They show a change, but to more mesic. It should be

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specified that the change is from before to after 6000 BP. It is not always clear in the text, particularly when you make a reference to 18 000 BP. 372, 23-24. Verb is lacking?

Introduction

 $373-10.\,\,18\,\,000\pm1000$

373 – 20. To Colombian but also to Mexican data (Ortega-Rosas et al., Global and Planetary Change 2008, see above)

375 – 3. Tierre del Fuego (Tierra)

375 – 17. Chronological order, 1968, 1998, 2000.

377 – 21. Of Latin America.

37 – 4. Xerophytic trees are (not is). But this is a PFT, not a biome.

379 – 21. To Peru and NW Mexico; due to the N and S Pacific anticyclones ... these areas receive... Except, particularly in Peru, when the area... El Niño events.

380 - 6. Palynologists

- 380 21. Present or, if the ... available, the
- 381 16. These were??
- 381 27. Non-arborescent

382 – 10. Is greater than that of Africa? I it, really? Isn't it biased by different sampling intensity or density? Are the samplings comparable (number of samples, elevations, geographical coverage, etc.?

383 – 12. Fig. 6. The PFT's in Fig. 6 are not the same that are referred to in the text. Maybe draw another table, with the 5 groups of PFT.

386 – 12. Tierre del Fuego (Tierra).

387 – 3. Weinmannia, and

387 – 17. It is not so clear in Yucatán.

389 – 26. La Primavera

389 – 27. Are located at high altitude (eliminate sites)

390 – 15. In southern South America, ... sites... (eliminate the first "sites")

390 - 16. From cool mixed forest and cool mixed forest. ? 390 - 22. Transition from CGSH / CGSS to COMI, not the other way. The same applies to p. 403 - 9 to 11, as

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well as to the abstract; you need to precise in what direction the change takes place.

- 394 11. The section 4.1 has no text.
- 395 12. Change (without s)
- 395 13. Nothofagus in italics
- 396 17. These tropical ... taxa are indicative
- 396 20 to 22. Verb is lacking.
- 398 9. Section 4.2.1. should be called 4.3 (or 4.2, see section 4.1)
- 399 4. Extirpated? Not extirpolated
- 399 8. Island and? May explain... Revise the sentence
- 402 20. It is unlikely to be?
- 404 8. Dominique Jolly.

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