

## ***Interactive comment on “Quality assessment of chronologies in Latin American pollen records: a contribution to centennial to millennial scale studies of environmental change” by S. G. A. Flantua et al.***

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We much appreciate the review report on our paper and we found it very helpful indeed to prepare an improved draft. We have included nearly all comments in the text and

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here we address each comment with explanation.

1) I understand that this paper is part of a special issue on the last termination. However I can see it is actually (at least) two different papers in one: i) a quality assessment of the chronology of the pollen database for NW-SA, and ii) the use of the database to characterize the last termination. The second part could come as a regional application of the quality assessment of the data. In this case, it needs to be better separated from the first part. In addition, the whole section 3 is dedicated to presenting the LAPDChronDB, which is off topic, as it is neither the NW-SA nor the last termination. This is an excellent paper which certainly deserves publication in *Climate of the Past*. However the main thread of the paper is not clear and the paper thus requires major reorganization before being published.

- Thank you for this valuable comment. To improve the structure of the paper and to explain better the connection between both sections, we made adjustments in the Title, the Abstract, Introduction and structure of the Methods. In the new draft of the manuscript we aimed at providing a much improved structure set out to the reader within the context of our working group.

2) The title is not representative of the content of the paper, although this is perhaps because I am confused about the main subject of the paper.

- Thank you for this suggestion. We adjusted the title to: “Chronology of Latin American Pollen records: LAPD Geochronological database and age models”

3) The authors mention they have been re-calibrating all the data, but it is not clear why.

- This is an important observation and we are grateful for the comment. Updated calibration curves (currently IntCal13/SHCal13; Reimer et al. 2013; Hogg et al. 2013) reflect our latest understanding of how  $^{14}\text{C}$  ages fluctuate over calendar time, and recalibrating  $^{14}\text{C}$  dates with the latest calibration curve will result in better age esti-

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mates. Many of the sites within the database were analysed using calibration curves that have now become obsolete. In section 2.2 Chronology evaluation for Northwest South America we added an additional explanation: New chronologies were generated with updated calibration curves to be able to implement the star classification system and to provide alternative chronologies to the researchers from the original chronologies to evaluate possible important differences between methods and calibration curves.

4) We would need an example of the possible benefits of re-calibration. How are the authors going to use their re-calibrated data? What do they intend to suggest to those who want to download the metadata from Neotoma and use a proper age model? Could they use the new one, if it is accessible?

- We will prepare make all results available through the supplementary information of CP and Fig.Share, the LAPD website (will be launched shortly) and as an additional feature in Neotoma. Thank you for the suggestion.

5) Other methods (including probability density functions) have been tested to avoid discussing the quality of an age model when one wants to use pollen counts that do not support a good chronological control (see for instance Hély et al. 2014). These methods should be added to the discussion. Hély, C., A.M. Lézine, and APD contributors. 2014. Holocene changes in African vegetation: tradeoff between climate and water availability. *Climate of the Past* 10: 681-686.

- Thank you for the suggested reference. In the section 4.2 Temporal uncertainty assessment of chronologies we added a comment considering the use of probability density function with Hély et al., 2014 as an example.

6) Seismic activities page 1233, line 33-39 The gaps in the records from the Choco are probably due to seismic activity but never show synchronicity (see also Lim et al. 2014).

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- This observation is corrected. From Urrego et al. 2006 we assumed more synchronicity than actually occurred, so we adjusted the entire paragraph to: "In some cases, seismic events leave their fingerprint in pollen records due to changes in fluvial drainage, hence erosive conditions (Lim et al., 2013). For example, over a large area in the Chocó Biogeographic region, gaps in records were probably caused by a series of intense drainage changes (Berrío et al., 2000; González and Correa, 2001; Urrego Giraldo and del Valle, 2002; Urrego et al., 2006; Lim et al., 2013). These events of high seismic activities can provide additional support for comparing chronologies when synchronous events are recorded in different records."

7) The discussion about the use of the NH or of the SH correction in the section 3.3 Calibration curves and software is interesting. Why don't you give an example of a calculation using the two corrections and show the time difference?

- The existence of a 14C age difference of up to a few decades between the northern and southern hemisphere is well known and has been discussed extensively in the literature, e.g. McCormac et al. 1998 (*Geophysical Research Letters* 25(9), 1321-1324; Turkney & Palmer, 2007 (*Quaternary research* 67(1), 174-180; Hogg et al. 2013 (*Radiocarbon* 55, 1889-1903). The difference between the NH and SH calibration curve is ca. 40yr but differs in time. Therefore we do not think that showing only one example of 14C dates calibrated with IntCal13 and SHCal13 would be very useful and of particularly relevant for our current paper. We could refer to papers that compare the two curves and discuss differences in more detail.

8) Concerning the description of sedimentation conditions (p. 1241 line 8-9), this is an important piece of information and should be discussed earlier as, apart from BACON software, age models rarely take this point into consideration.

- Thank you for this comment. We added at P.1236 L.15 the following phrase: The authors included a priori information on sedimentation rates and tephra-layers to construct the age model and consequently derive the best age for an uncertain tephra

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deposition. The use of the sedimentation conditions is a highly relevant component for age model development but rarely seen to be taken into account.

9) The Bayesian approach (section 4.2) should appear in the age model, in the methods section 2.3. - We moved the section on Bayesian approach from the Discussion section to the Results section. Thank you for this suggestion.

10) Figure 3: Would MIS 3 stand as an example of the use of re-calibration?

- Yes. The re-calibration was aimed to a) provide alternative age models for those records without age models or with only linear interpolation; b) implement the star classification system on the updated age models; c) use the new, longer calibration curve, which now covers the MIS3, for southern hemisphere records. We included an additional comment to the figure caption to emphasize this.

11) Does figure 3 show the results of NW-SA or LAPD? Why only MIS 3? Why not all the data for NW-SA?

- To create Fig. 3 data from NW-SA were used. We decided not to use the chronologies beyond MIS3 because of the very low number of sites available (Fig. 3b and Fig.4).

12) The following references should be added: Blaauw and Christen, 2011 Maezumi et al., 2015

- We checked these references both in the text (both on P. 1236) as also in the reference list, and they were correctly mentioned in the current paper. We are not sure what else the reviewer could be meaning.

We thank the reviewer for her valuable comments and we are very satisfied to see the suggestions improving the paper greatly.

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