Technische Universität Braunschweig
Institut für Geosysteme und Bioindikation

Technische Universität Braunschweig | Institut für Geosysteme und Bioindikation
Langer Kamp 19c | D-38106 Braunschweig | Deutschland

Rodrigo Martínez Abarca, M.Sc.

Langer Kamp 19c
D-38106 Braunschweig
Germany

Tel. +49 (0) 531 391-7259
Fax +49 (0) 531 391-8130
http://www.tu-braunschweig.de /igeo
l.martinez-abarca@tu-braunschweig.de

Climate of the Past
Keely Mills
Editor

24.04.2023

Dear Editor,

Please find enclosed our revised manuscript entitled "*Millennial hydrological variability in the continental northern Neotropics during MIS3-2 (59-15 cal ka BP) inferred from sediments of Lake Petén Itzá, Guatemala"* (Egusphere-2022-787) that we are submitting for your final consideration and publication in Climate of the Past. We are grateful with you and Sarah Metcalfe whose comments, suggestions and insightful considerations have helped to significantly improve the manuscript.

This revised manuscript contains all the modifications and corrections according to the latest suggestions from Sarah Metcalfe, minor grammar and style changes, as well as the appendices were added at the end of the document as the editorial team has requested. In the next pages, we responded to the last comments and suggestions which can be followed through this new version by the track changes.

We hope that you find the revised version suitable for publication in Climate of the Past and are looking forward to hearing from you.

Sincerely,

Rodrigo Martinez-Abarca

Abstract

Line 11. Although this refers to the LGM in general, the paper (lines 62-66) actually says that by 19 cal ka conditions were drier, so I suggest some minor redrafting to deal with this.

Indeed, LGM has been reconstructed as a wet period as mentioned in line 11 of the abstract. However, lines 62-66 of the introduction refer to the HS1 event starting at 19 kyr. We have modified lines 62-65 to make it clearer that these dry conditions correspond to HS1 and not LGM.

Lines 24-25. Two uses of 'whereas' in close proximity. Could change the second one to 'While'

Correction applied

Introduction

Lines 36 and 38. I would insert 'the' before Hudson Strait in both cases.

Correction applied

Lines 62-63. Surely the point here is that the stable isotope measurements indicate dry conditions, which in turn lead to low lake levels. The low lake levels are not shown by the isotope measurements.

There is probably an overinterpretation of stable isotope measurements (particularly oxygen) in this sentence. Following the proxy interpretation of the authors (Escobar et al. 2012), the values of $\delta^{18}O$ in the water depend, among other factors, on the Evaporation/Precipitation (E/P) balance, which modifies the proportion of isotopes in the lake. Subsequently, the isotopes are fixed to the ostracods calcareous structures and consequently reflect the evaporation rate of the system and indirectly the lake levels. A higher value of $\delta^{18}O$ entails a lower E/P balance and therefore a higher lake level. We have rewritten this sentence in line 63.

Line 70. I'd delete 'a' from before 'higher mean long-term…'

Correction applied

Line 74. influences

Correction applied

Line 87. Elsewhere you refer to rainy season (not rain)

It was a mistake of typing, we have rewritten it as "rainy".

Line 96. This is a narrow view of the timing of the monsoon, it migrates north and south between July and September.

We have modified the sentence paying attention to the correction (lines 97-98)

Figure 1. Where does this definition (mapping) of Neotropical come from.

We have added the reference (Löwenberg-Neto, 2014). The reference has been also added in the reference list.

Methods

Line 141. I believe these 20 radiocarbon ages come from PI-6 so make that clear here (you state that the dated tephra layers are from PI-2). Results It isn't clear to me why the text about Mn/Fe ratios (lines 237-242) is separate from all the other text about the CLR values (on p.8). I'd put them all together.

We modified the order of the paragraphs to make them consistent with the methods. XRF: 1) CLR Ti, 2) CLR Ca/(Ti+Fe), 3) CLR Mn/Fe; DRX: 1) Mineralogy, 2) $CaCO_3$; Bulk sediment: 1) TOC, 2) Molar TOC/TN.

Discussion

Lines 303-304. This reference to winter rains is very different from any of the other mechanisms invoked in this paper, but passes without comment. It you believe this to be true, then I think you should at least point out that this period is exceptional during the period of record (given the ITCZ to S is normally dry), but presumably the presence of the very large LIS may potentially have driven winter cold fronts this far south.

We have eliminated this sentence since it contradicts the interpretations of the following paragraph (ITCZ to the north), so the role of winter rain was probably less due to the northward displacement of the trade-winds.

Line 340-341. As our 2015 paper only deals with the last 12,000 years I am not sure where this interpretation of what it says has actually come from! The paper does, of course, make the point that warming of the NH triggered a marked strengthening of the NAM. There is clear evidence for change in the NAM strength prior to 12 cal ka., including suggestions of a stronger NAM during MIS3.

We agree that the 2015 paper only covers the last 12,000 years. We have found that the paper by Roy et al. (2013) and also in an abstract published by Metcalfe et al. (2012) mention is made of a strengthened NAM during MIS3 and particularly in the interstadials that occur in it. This is based on records from northern Mexico. The references have been changed and the sentence modified (lines 356-361).

Line 412. 'high nutrient input'

Correction applied

Line 428. Insert space between PI-6 and (Fig.4…)

Correction applied

Line 438. Reference to Unit 4. Now that the original Table 2 has gone from the main text, I struggled to find the ages for Unit 4. Is this information still going to be given somewhere?

At the beginning of each subsection of the discussion (e.g. Section 5.1.1; Lines 284-285) mention is made of the lithostratigraphic unit to which the period in question corresponds, as well as the ages. For this reason, we moved the original Table 2 to the appendices (Appendix C). However, following the reviewer's suggestions, we have added the ages of each unit in parentheses in the introductory paragraph of the discussion (lines 278-280).

Line 439. I have looked again at the paper by Donders et al. (2011) and cannot see how/where it says what is claimed here. It is focused on H events (wet in Florida), but I cannot see the case made there for drying 39-23. The modelling was only for the LGM, H0 and variants of H1 I think. Please check.

We completely agree with the reviewer. This sentence was made based on the visual interpretation of data presented in Figure 3 of Donders et al. (2011) (summer precipitation). However, we agree that the most important changes in precipitation in this record occur during the HS and the LGM. For this reason, we have eliminated this line.

Figure 7 and Line 496. Sorry to come back to this, but I am still unhappy with the interpretations of the Babicora record. The diatoms (Metcalfe et al., 2002) clearly show persistence of a relatively deep and

freshwater lake through the LGM (if shallower and more turbid than previously). There is evidence for catchment instability. As noted previously, the big change (drying) here occurred about 15 cal ka.

We have reviewed in detail the reference suggested by the reviewer (Metcalfe et al. 2002) and agree to change the interpretation of the Babicora record in both figure 7 and line 496 (now 513).

Lines 496-497. As noted previously the LGM was not dry at either Patzcuaro or Babicora. Just less wet/deep than earlier in the records. I also see you are still referring to the Bradbury 1997 paper which is now rather old. For La Piscina de Yuriria dry conditions leading up to the LGM are confirmed in the more comprehensive paper of Holmes et al. 2016 (JQS).

We agree with the correction. We have modified the interpretation of Babicora and Patzcuaro both in the text and in Figure 7. We have deleted the Bradbury (1997) reference and added the interpretations of Holmes et al. (2016) to Figure 7 and in the text (line 515).

Lines 496-498. Are the square brackets deliberate?

We have replaced the brackets with parentheses to make the text easier to read.