Second Review of Muñoz et al., bg-2018-396

Summary

The revised version of the Manuscript “Reconstructing past variations in environmental conditions and paleoproductivity over the last ~8000 years off Central Chile (30° S) presents an improvement introducing and discussing their data in context of ocean-atmosphere interactions and more importantly comparison with and reference to previous data from the region. However, I still have two major points of criticism, (1) the introduction is still not well written enough and is missing information about proxies being applied to support previous observations and conclusions and more essentially the motivation of the Authors to select the study sites and the proxies ultimately utilized, (2) Although ta paleodiscussion was now added, the discussion is still mainly discusses each result point by point, appears unfocused and needs re-structuring.

Overall there is still a main question or motivation missing throughout the manuscript, there need to be some sentences added why the authors selected the study are and what they hope to improve in the paleoceanographic knowledge about the SE Pacific. I am not convinced by the paragraph (line 120-126) where the Authors introduce their work, there is little connection to what was written in the introduction before.

The Authors improved the introduction by adding more detailed information about the ocean-atmosphere dynamics relevant in the study area. Unfortunately, references to previous work is still too vague, for example just referring to “sedimentary records of several proxies”. I think the authors deleted important information on how changes in the ocean-atmosphere dynamics are reflected within sediment records from the previous version. And thus, an introduction about what proxies are feasible to use for the authors research question is basically completely missing. Following on that, there is no information provided on what the others selection of proxies applied was based. Suggestions from my side how to improve the structure of the introduction can be found under the line-to line comments.

Furthermore, the structure is still a bit strange with specific information about the area, then explaining general observations from the SE Pacific This should be reversed, going from the big picture to the study area.

The Discussion of the new data presented by the Authors based on climatic changes and the comparison with previous studies significantly improved in section 5.4 climatic interpretations. However, I think the structure of the discussion needs still improvement. At the moment the different proxies are discussed successively, but this structure results sometimes in non-chronological description of the significant periods highlighted in the manuscript. I suggest to re-structure the discussion in first the modern conditions and afterwards the 3 time intervals (> 6 kyrs, 2.1 to 4.6 kyrs and recent to 260 yrs BP) and finish with section 5.4 climatic interpretations presented in the current manuscript. As the definition of these time intervals is also one of the mayor findings of the study, this structure would improve their significance to the reader.

The text needs still a lot of improvement. Paragraphs are often not properly connected to guide the reader and several grammatical errors are distributed throughout the whole text. Furthermore, the use of “decrease” and “increase” is often inappropriate, as there are no values given for comparison, for example the authors conclude in line 858 that nutrient-type elements are **reduced** at present and **higher** at cal BP 6500.

On the whole manuscript is too long and especially methods descriptions are too detailed. When applying commonly used methods it is sufficient too shortly describe the procedure and refer to the original publication. Detailed explanations are only needed if analysis vary from normal procedures. I suggested some superfluous information under the detailed comments to shorten the manuscript.

The figures were all improved following previous reviewer’s suggestions, however Figure 9 presenting the Pollen record is still the only figure were age is given on the x-axis instead of the y-axis. The Authors didn’t give a reason for not changing this, it would help comparing the data.

Line by line comments:

Line 34: change “in” to “at” and I don’t the commas are needed here.

Line 46-47: rephrase “The first period was conspicuously high...” it is not the period that is high but the productivity during this period, change to something like “The productivity during the first period was conspicuously high...”

Line 49: rephrase “this period reached a maximum at ...” what maximum was reached, needs to be spelled out

Line 52: again rephrase “, being remarkably stronger in the last 2000 years” are you referring to oxygen levels?

Line 64: change “are developed” to “develops”

Line 69: rephrase, second sentence in a row starting with “this high productivity...”

Line 71: Is “where their intensity, ...” supposed to refer to the OMZ? Then please use the singular i.e. “where it’s ... “

Line 91: change to “have also been linked”

Line 92: change to “influences”

Line 93: change “this latter an important forcing” to “which acts as an important forcing”

Line 94 onwards: this connection is confusing, you refer to “this variability” producing humid and arid conditions, you seem to refer to changes in the processes (i.e. sea ice

extent, Hadley cell and latitudinal position of the ITCZ. However, you only mention fluctuations in upwelling in the previous sentence. I suggest changing the beginning of the sentence into “Changes/Variability in the austral insolation and the related processes/mechanisms produce...”

Line 96: change “on top of all this” into “An additional important driver...”.

Line 120 to 126: This is a summary of what you did, I rather expect here a paragraph about why you selected your core positions on the basis of the introduction you give

Line 176 to 179: delete, these are common procedures and you are not referring to this information in the following.

Line 184 to 211: remove text. All this information is repeated in the following sections, or if not can be added to the appropriate section for each proxy.

Line 241: remove “ages were calculated using 5568 (yrs) as the half-life of radiocarbon” superfluous.

Line 260: I think you can shorten 3.4 Trace Metal analysis. I am not familiar with the method myself but the descriptions appear extremely detailed and could be shorten, as it is commonly applied.

Line 293: section 3.5 TOC and stable isotopes can be significantly shortened, it is sufficient to explain how much material was weighed into tin and silver capsules respectively and where in what machine analysis have been performed, and of course the external reproducibility of measurements must be given. It is not needed to explain the entire procedure of the measurements. In short rephrase the sentence in line 296 to 298 and remove the text until line 306.

Line 482: add “are” behind Trace metals

Line 511: “This is the result of the wind” please elaborate a bit more in what way this is caused by the winds

Line 532 and 533: change “more negative” to “lighter”

Line 539 and thereafter: change NO_3 to NO_3^- or use “nitrate”

Line 630: not sure what the Authors are referring to as “it”

Line 716: remove “notorious”

Line 777: change “trend” to “trends”

Line 840: Change “Our result indicates” to “our results indicate”

Line 843: change to “we interpret this difference as...”

Line. 848: add how these redox conditions have been reconstructed.

Line 856: change “where” to “were”

Line 857: get rid of “the presence of”