

## ***Interactive comment on “Vegetation and geochemical responses to Holocene rapid climate change in Sierra Nevada (SE Iberia): The Laguna Hondera record” by Jose Manuel Mesa-Fernández et al.***

### **Anonymous Referee #1**

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Referee Comment for "Vegetation and geochemical responses to Holocene rapid climate change in Sierra Nevada (SE Iberia): The Laguna Hondera record" Author(s): Jose Manuel Mesa-Fernández et al.

1. Does the paper address relevant scientific questions within the scope of CP?

Yes.

2. Does the paper present novel concepts, ideas, tools, or data?

The data is new and confirms to some degree other datasets from southern Spain/the

Mediterranean region.

3. Are substantial conclusions reached?

Yes.

4. Are the scientific methods and assumptions valid and clearly outlined?

Yes, but some methods could be outlined in more detail.

5. Are the results sufficient to support the interpretations and conclusions?

Generally yes.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

Yes, but there is room for improvement.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Generally yes, but it could be stated even more clearly what is special about the new record in the interpretation and/or how it differentiates from other records.

8. Does the title clearly reflect the contents of the paper?

Yes.

9. Does the abstract provide a concise and complete summary?

Yes.

10. Is the overall presentation well structured and clear?

The paper is well-structured.

11. Is the language fluent and precise?

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Generally yes. The English sounded strange to me in some very few cases (mentioned below), but I am not a native speaker.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

Yes.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

Yes, in a few cases.

14. Are the number and quality of references appropriate?

Yes.

15. Is the amount and quality of supplementary material appropriate?

The supplementary material could be used to give more information on methods (e.g. pollen differentiation and the used cluster analysis).

Dear authors (and dear editor),

let me first state that I am palynologist, thus, it would be good if a second referee would be a sedimentologist/geochemist with experience concerning the geochemical record, which seems to me to be of more relevance for the manuscript (ms in following) than the pollen record.

I find this manuscript interesting and think that it may be worth publishing. It is already convincing in many aspects, and as I have seen, it has already been improved due to remarks by Nathalie Combourieu Nebout. There are still some general aspects and also some aspects concerning the palynological data which I think should be explained/improved/changed.

One of my main concerns is that bisaccate pollen with its particularly excellent eolian

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transport characteristics accounts for 80% of the pollen sum in several samples, and not only in the lower part of the record, which means that the counting sum for the remaining pollen types is only 60 grains... Thus, I wonder how robust the pollen signal is. In a marine record, you would probably exclude *Pinus/bisaccate* pollen – I am not sure if this would not also make sense in case of Laguna Hondera, since I would expect this pollen type to be overrepresented. At least, you should discuss aspects like eolian transport affecting the pollen data. Eolian transport is often discussed in the MS in context with the geochemical data, but, if I have not missed it, not in context with the pollen signal. I could for example imagine that even minor changes in wind direction may lead to significant signals in the *Pinus* signals. Maybe there is even the possibility to use the geochemical data to get an idea how wind direction and energy changed over time? It is unfortunate that the pollen preservation and sample density is not high in the lower part of the record, it seems to me that otherwise you could find a correlation between K/Ti and tree pollen. . .

In this context, I also wonder if it is a good move to use the pollen zonation also as a base to describe the geochemical results. Particularly in the lower part, the CONISS-based zonation does not seem to be very relevant considering the resulting dendrogram depicted in Fig. 3. Additionally, I cannot completely follow the zonation as described in the text, I think there are discrepancies with the cluster analysis.

Kind regards.

Below, I make detailed remarks/corrections.

Abstract:

Line 22 “magnetic susceptibility proxies” makes no sense – this sounds as if you measured a proxy for magnetic susceptibility. Rephrase.

Line 22 and following: You state later in the text that the pollen record is not reliable until ~7000 cal yr BP, yet you state here that palynological proxies indicate humid conditions

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until ~7000 cal yr BP. This should be rephrased.

Generally, I would not introduce abbreviations in the abstract.

### 2.1. Regional climate and vegetation

Line 79: “. . . which in turn controls. . .” If this relates to “altitudinal contrasts”, the verb should be in plural.

Line 86: “(1900 -2800 m)” – blank space behind “-“

Line 86 and Line 89: The “,” behind the brackets should be removed.

Line 89: Here, a long dash is used (600 – 1400 m).

### 2.2. Laguna Hondera

Sometimes there is a blank space between value and unit (“2800 m”), sometimes not (“3366m”): Make it consistent.

### 3.2 Pollen

Consider my general comment above: The counting sum is generally okay, but with both bisaccate and Poaceae included, it is not that impressive. I must also admit that I find it difficult to separate *Olea* pollen from, e.g., *Phillyrea*, at only 400x magnification. Since *Olea* is important for the discussion and even mentioned in the abstract, and other Oleaceae are not mentioned in the pollen diagram, it might be interesting to show an encountered *Olea* grain in the supplements and/or to discuss how *Olea* was differentiated.

Line 127: “*Typha*” should be in italics.

Line 127/128: “. . . plotted using Tilia program. . .” This does not sound like proper English to me.

Line 129: Maybe a few more sentence to the cluster analyses could help. I was not aware of CONISS until now and learned from Grimm (1987) that normally the used

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algorithm operates on a dissimilarity matrix of squared Euclidian distances. Was this the case in your analysis? Did you do an unconstrained analyses to control your results? Generally, I wonder if it makes sense to use the algorithm of Grimm (1987) with a dataset in relatively low resolution and at the same time significant variance between stratigraphically neighboring samples (in the lower part at least), but this is probably a matter of taste and you mention the problem later to some degree...

### 3.5 Statistical Analyses

Line 156: "PCA finds. . ." Is this proper English?

A few more details may be interesting. What was used, R-mode or Q-mode?

### 4.2 Chronology and sedimentation rate

Line 169: "The age model" instead of "The age –model".

### 4.3 Pollen

Generally, I think there are too many pollen zones based on the cluster analyses. Instead of 6-7 zones, I would rather suggest to reduce this to 4 zones considering the distances shown in Fig. 3. Or perhaps you should use another way to define the zones.

Line 183: I am not sure if I misunderstand something here: In Fig. 3, to me there seem to be two samples within Zone LH-1. A third sample is just above the borderline to Zone LH-2. This makes also sense since the dendrogram in Fig. 3 implies that the two lowermost samples are grouped together, while the third sample from below is more similar to the samples in LH-2. One factor which might cause this is the high abundance of Asteraceae in the two lowermost samples. However, in the text, it is mentioned that three samples define the lowermost zone (LH-1), and this is repeated later in line 311. This is of importance since the pollen zonation is also used for the interpretation of the geochemical data. In this context: The zone borderlines in Fig. 4 are at slightly different depths than in Fig. 3 (see below).

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Line 186: “takes place” sounds strange to me in this context.

Line 187: “Caryophyllaceae”: I am not sure about the grammar here – while you can read many English texts using family names in singular, I still think it should be used as a plural form. In any case, here and in the following cases, it would probably be best to combine the family name with “pollen” or “pollen grains”, in this case e.g. “Caryophyllaceae pollen” with singular or “Caryophyllaceae pollen grains” with plural.

Line 191: “Quercus” should be in italics. And (see above) it may be clearer to write “Quercus pollen”.

Line 193: “is less” does not sound like proper English to me.

Line 196: “Zone LH-3. . . is defined primarily by a great increase in Poaceae pollen. . .” This is confusing. Is it possible with CONISS to check which parameters influenced the resulting cluster more or less? Or did you make a control test without Poaceae pollen? (You are probably right, but still, I suggest to rephrase this sentence!)

Line 201: You can as well remove “in this zone”, it is redundant.

Line 210: Maybe I completely misunderstand how the cluster analysis is used. According to the dendrogram in Fig. 3, Zone LH-6A appears to be more similar to Zone LH-5 than to Zone LH-6B. Following the analyses, LH-6A should rather be LH-5B. . . Or did you have additional reasons to combine 6A and 6B? But then, this should be explained.

Line 210: Here and in Fig. 3, capitalized As and Bs are used for the subzones (LH-6A and LH-6B), but in the results concerning the geochemical data, the subzones are named LH-G6a and LH-G6b. Furthermore, in Fig. 4, there is no “G” in front of the subzone number.

#### 4.4 Sediment composition

Line 218: “. . . makes it important. . .” Sounds strange to me.

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Line 224/225: "... or high organic and water content that increase..." Not sure here, but I guess either "contents" or "increases".

Line 249: Remove blank space after "~". Considering the geochemical data, it may make sense to have a subunit LH-6A, but as mentioned above, I think this is not really supported by the pollen data. Would it make sense to define units using both pollen and geochemical data?

## 5. Discussion

As written above, I cannot really evaluate the quality of the interpretation of the geochemical record, particularly section 5.3 is not really part of my expertise.

### 5.1.1.

Line 311: See above: Why three samples?

### 5.1.2.

Line 383: The mentioned peak in Artemisia is quite weak, I think, and only consists of one sample. There are much stronger peaks above...

### 5.1.3.

Line 421: I think this is a good example for the "Pinus problem": In the short interval between 2300 and 1800 cal yr BP, I cannot really see the decreasing trend in tree pollen that you postulate, instead, I just see fluctuating tree pollen percentages, and this may be partly caused by pollen transport effects (e.g. changes in wind direction). Maybe the longer interval from 2500 to 1200 cal yr BP in total reflects a decrease in tree pollen (but with fluctuations).

Line 421: "... between 2300-1800...": I would either suggest "between 2300 and 1800 cal yr BP" (add the unit!) or "from 2300 to 1800 cal yr BP". This is also occurring earlier (e.g. Line 384). But maybe it is all right the way used in the MS if it fits with the style of CoP.

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## 5.1.4. and 5.1.5.

I think interpretation becomes “stronger” (if you like) in these sections, not least since the pollen data is probably more robust here. However, concerning section 5.1.4., I wondered if it is not possible to discuss differences between LH and the other mentioned records instead of just mentioning that there were arid conditions “everywhere”. What differentiates your pollen record from other records from the western Mediterranean region, and how can these differences be explained?

## Conclusions

Line 543: Add “at” before “~” and remove the blank space behind “~”.

Again, the “between XXXX-XXXX” problem occurs here several times.

Line 554: replace “is” with “are”.

## Acknowledgements

Line 568: Replace “acknowledge” with “acknowledges”.

## References

In some cases, there are blank spaces between the initials, in some cases not.

## Figures

The abbreviation “LH” should be explained in the figure texts, even if it is already explained in the main text, too, since figure texts should be understandable on their own.

## Figure 1:

The figure is quite fancy, but printed (particularly in black and white), it is difficult to see what it is depicted. I would prefer outlined maps instead of the first two photos. But this is rather a remark, since it is a matter of taste.

## Figure 2:

I think some texts are too small here, e.g. “Age “ and “Depth”.

Figure 4:

It is a little confusing that you use 4 cm steps here for the depth scale, but 5 cm in figure 3. The pollen zones seem to be slightly shifted compared to Fig. 3, e.g., the borderline between zone 3 and 4 seems to be at 38 cm in Fig. 3, but 36 cm in Fig. 4. Similarly, the borderline between zones 2 and 1 seems to be at 60 cm in Fig. 3, but at 59 cm in Fig. 4.

The names of the subzones differ from Fig. 3 (see above).

Figure text: “Pollen zonation described in section 4.3 was used.” Is this proper English?

Figure 7:

“Quercus” is not in italics in all cases. “Artemisia” is not in italics in the figure text.

Figure 8:

The yellow scales are quite close to each other.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2018-35>, 2018.

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