

## ***Interactive comment on “Heinrich Event 4 characterized by terrestrial proxies in southwestern Europe” by J. M. López-García et al.***

### **Anonymous Referee #2**

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This paper concerns an interesting study on micro vertebrate communities and develops interpretations in terms of environment and climate. It is focused on Heinrich events, especially H4, which is no common for such studies on micro vertebrates at my knowledge. These topics seem very attractive to me as it is very exciting to have a look on the impact of abrupt events on all the components of the continental ecosystems.

Nevertheless this paper needs to be improved as it suffers of some unclear points and the reader has several troubles to understand the method and to follow the progression of the argument.

Authors have therefore to clarify their text in order to be sufficiently clear for the large panel of scientist that may be interested on these topics

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## General comments

The paper suffers of some lacks in the bibliography concerning the Heinrich events around the Spanish peninsula. There are interesting papers published on vegetation and climate on the stage 3 and Heinrich events such as Fletcher et al., 2010; Bout-Roumazeille et al., 2006; Combourieu Nebout et al., 2002 . . . , which needs to be cited in this paper especially in the introduction and discussion as they cover the studied period and may be useful for interpretation. Beaudoin et al. present also studies in the gulf of lion that may be interesting even if they remain less detailed for what concern the H4 event.

### 1-Introduction :

The author only present their study but it will be informative if they also have to tell which question they want to address through their study. Why is their study so interesting for the knowledge of the abrupt Heinrich event 4. Which new information do they expect to bring through their study?

### 2-Site description:

This part concerns also the chronology and the authors have to change the title in site “description and chronology”. The age have been calculated on charcoals . OK but we have five samples (not several – be precise) and five dates in a range that have to be noted. Where were the samples taken? I suppose in the studied archeological level, it is not said or I have not seen that information. Where is the error inferred to the calculation of ages? The authors write  $\sim 39,6$  cal kyr but when we have a look at Fig. 2, the ages are displayed from 38,6 to 40,2 cal kyr (and in a wider range if we consider all the different ranges of ages. Authors have to present a range of age or in a better way the average age with an error bar, it will be better.

### 3-Method

-Paleoenvironmental reconstruction

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I have understood that the taxa are gathered in groups in function of their habitat by reference to present day. Nevertheless the definition of the habitats and of chorotypes remains imprecise or incomplete. Perhaps it will be helpful to have a table that show present-day taxa in relation to their present environment and climate as this is largely used in the discussion after. The composition of the chorotypes and their precise climate attribution in terms of temperature and precipitation is also needed. Then differences will be better seen. (Ex: the difference between the chorotype 1 and 2 is not clear as it is defined as group with precipitation requirement above 600 mm per year. Does it means it corresponds to 600 to 800 mm MAT for the chorotype 2 and only upper than 800 mm to chorotype 1). Chorotype 3 seems to be a mixing with no real significance. That remains a bit short for me. Why do the authors separate the dry and wet meadows and gathered the two types of woodlands? Authors have to explain a little all their choices. Is it classically used and why? Or is it a personal choice?

-Palaeoclimatic reconstruction

Authors present the description of Iberian peninsula today and say that the conditions may change abruptly from a place to another especially with mountains. Nevertheless we have no example of what is the diversity of climate and what are the consequences on the fauna and its repartition today. I think it will be an important precision to have if they use that fact as a premise for their interpretation. They may eventually base their talk on a short paragraph and few references. Probably it will be helpful to have a short paragraph on the method used for the calculation of the potential palaeoclimatic conditions. The sentences are insufficient as all the argument is based on that. And the explanations are not clear for me. What is exactly the MCR method? It is not sufficient to write the name and reference. I understand that the climate parameters have been calculated by reference to present day ones. Is it done only by a simple difference? I do not understand exactly how the parameters are calculated. Do the authors use a database that links present-day association and climate, or only the present day parameters?

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#### 4-Results :

Description of assemblages could be more structured to be easy to read for the non-specialist reader

-Palaeoenvironmental and palaeoclimatic reconstruction

I do not understand what means the “resulting intersection”. It is relevant to information in method!! Are the values in parenthesis corresponded to the calculated values or to the difference to present day in Barcelona?? It is not precise (The deviation of the calculated parameter to the present-day data have to be noted in the table of results). It is important because in the discussion these values are compared to pollen inferred temperature and precipitation reconstruction that are not a difference to present day. Same remark may be done about the precipitation. Perhaps I do not understand well the method!! The authors say that the climate is more humid during the H4!! It is surprising as other data in Mediterranean show the opposite!! The authors have poorly expressed their idea or I have not understood the sentences. What is the significance of harsher conditions? Cold, dry???? And that is relatively to what??

-Comparison and discussion

Comparison with other terrestrial proxies

In page 659, the authors mixed the vegetation and fauna information: *Artemisia* (in italic please) is at the end of a list of animals. Perhaps it should be better to attribute the names in different parenthesis after pollen, avifauna and large mammals. Then we may see directly what belongs to each kind of data. *Pinus Sylvestris* do not indicate alone a woodland or a temperate forest. Authors have to precise the charcoal association. We may have a steppe with some rare trees understand that pine has been found in pollen analyses that may correspond to such hypothesis. The sentence page 659 l. 1-3 is not clear as it combines plants taxa (*Pinus*) and micro fauna (*Sus*, *Lynx*..) at the same level. When they write “What is indicated. . . Is the same. . .? Does it mean that

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there are several samples in different age position (it is not indicated above). They do not talk about an alternation if they have only one sample. The results correspond, in my opinion, to a mixed assemblages that evokes a mixing between local fauna and an additional fauna probably comes from the north due to the deterioration of the climate condition in the northern countries and that are organized according to their requirements. When authors talk about colder conditions than today, can they give values here (p. 659 l.13)?

I am not convinced by the interpretation of the opposite results from the different kinds of data : steppe and forest!!. Authors have to reinforce their argument. Perhaps your fauna corresponds to a transition phase. It could not be unrealistic if we consider the possible age error bars attributed to the fauna.

What is the meaning of Ch 1 & and Ch2. Probably it is corresponds to the chorotypes but it is not indicated.

#### Comparison with other sites

I do not understand the comparison with other Spanish sites. First, we are at the limit of the possibilities of  $^{14}\text{C}$  dating and ages have to be taken into account with lot of caution. Secondly, as all ages have their error bar, the three sites cited may be considered as of the same age and thus why do the authors move the sites compared to the others on the figure 8. I do not agree with that. In addition, Authors have to look at the paper of Fletcher and Sánchez Goñi (2008) that show the abrupt events during the last 48 kyr and compare the response of the vegetation in the different events. In the case of authors do not consider the ages but the location of the three sites, the interpretation is more realistic but the differences between them may temporized according to possible lag of site ages.

#### 5-Discussion

The comparison with pollen inferred climate data has to be done with caution and after

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the precision requested above on the calculation of the climate values. In addition authors have to consider the problem of ages (uncertainties and method limit) and the possibilities (i) that the three sites of H4 period have the same age and (ii) that the assemblages may be either really inside the H4 or possibly in a transition phase before or after the event. They have to discuss that points. Note that the H3 is less detailed in the chosen reference (see Fletcher and Sánchez Goñi – 2008 for further details). This part needs more argument to be really robust and I recommend that it was rewritten with more effort to argue with a figure more convincing than the Figure 8.

6-Minor remarks:

Take attention to typology errors in the text especially in the names of cited authors.

p. 653 l. 14-17, could you please change “variability sized region”. What does it mean?

p. 654 l. 11-12 and 13-15, rephrase these sentences. I do not understand p. 655 l. 29, “very well” should be replaced by “high” p. 656 l. 27-29, please rephrase this unclear sentence

This interesting paper deserves publication in *Climate of the Past*. Nevertheless, I recommend this publication after corrections and I hope that my suggestions will be helpful and adequate for authors to improve and clarify their paper.

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Interactive comment on *Clim. Past Discuss.*, 9, 647, 2013.

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