

# ***Interactive comment on “Climatic subdivision of Heinrich Stadial 1 based on centennial-scale paleoenvironmental changes observed in the western Mediterranean area” by Jon Camuera et al.***

**Anonymous Referee #1**

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## General comments

The manuscript by Jon Camuera and colleagues describes paleoenvironmental changes in southern Iberia during the last deglaciation focusing on Heinrich Stadial 1 (HS1). The authors observe a novel subdivision of HS1 in the analyzed Padul record and in other records from the Western Mediterranean and Greenland. They come to the conclusion that solar forcing accounted for an detected  $\sim$ 2000 and  $\sim$ 800 yrs climate cyclicity.

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The study presents novel ideas and addresses relevant questions within the scope of the journal Climate of the Past. It is well structured, easy to follow, and concisely written. Figures are of good quality.

However, I have two main concerns. Firstly, it is not always clear whether data is new, already published, or already published but analyzed/shown in a new way. This concerns mainly the own previous studies. Nevertheless, it is important to exactly indicate the sources to avoid (self-) plagiarism (see also specific comments).

Secondly, the age-depth model is not as robust as stated. That does probably not affect the observed climate pattern but it may affect the cyclostratigraphic analysis. The age-depth model is based on radiocarbon dates of organic bulk sediments that might need a reservoir correction. Particularly in a wetland setting, a reservoir age of aquatic and semi-aquatic plants must be considered. The uncertainties of the age-depth model need to be taken into account and should be critically discussed when correlating records and when analyzing cyclicity.

#### Specific comments

23/62: Please relativize the terms “robust” and “accurate”.

25: Please clarify which resolution is improved.

34/35: Why does natural climatic variability underlie abrupt anthropogenic climate change? Please clarify or rephrase.

55: Please mention the section “Regional and Local Settings” of the Supplementary Information here. In addition, please delete “new” to avoid misunderstanding.

62–64: Please add reference of the radiocarbon dates.

65/66: Please add reference of the pollen data, e.g. add “based on palynological data by...” after “Precipitation Index (Ip)”. If I understood it right, the palynological data has already been published, but it is not clearly stated in the manuscript.

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81–83: How is the start (lower boundary) of HS1 defined in your record? Could it have also started at ca. 18.7 kyr when Si, Mediterranean forest, PCI and Ip start to decline?

97/98: Please add “(Fig. 3b, c)” after SST reconstructions and “Cacho et al., 1999; 2006” to the references.

102–104: Please rephrase the sentence because the SST records published by Cacho et al., 1999; 2006 originate from the Alboran Sea as well.

109–111: Please add PCI because it shows the same pattern.

112: Please replace “(Fig. 3a, b)” by “(Fig. 3b)”.

136–157: The presented explanations and records are not strong enough to conclude an early HS1 and Bølling-Allerød in the Mediterranean.

159–169: Please add comparisons with other regional records.

166–169: Xerophytes decrease at first. How can that be explained? How is the lower boundary of the YD defined in your record? Better mention the Ip value to suggest arid conditions. In general, it would be nice to see a detailed pollen diagram in the supplement to comprehend the stated climate variations.

185–188: The D/O-record for 20–11 kyr is well defined and does not show a ~2 kyr cyclicity.

244: I appreciate that you provide the data in an online repository. However, I suggest adding the complete palynological dataset to the repository for replicability.

Figure 2–5: Please indicate all sources of data.

Figure 2a: The uncertainty of the age-depth model is underestimated where no dates are available. Please use a model that accounts better for uncertainties. In addition, please add the dates that you rejected to Fig. 2a, e.g. in a different color.

Figure 4: I suggest to use always “xerophyte percentages” instead of “raw xerophyte

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data" and "raw xerophyte percentages" (also in Supplementary Information line 120). In addition, please indicate the meaning of the green lines (confidence interval) in the figure caption. Which periodicity is shown by the first peak in Fig. 4d and why is it not mentioned?

Supplementary Information (SI): The Supplementary Information is a rather extensive compilation of additional details. I appreciate the methodological details here. However, I suggest including the previous studies to the main text because they contain important data for comparison. For an even better comparison, I suggest adding this study to table S1.

Table S2: Please add source (reference or this study) to each date.

SI 54: Please add one or two sentences about the recent vegetation.

SI 91–93/100: Please indicate which taxa are mesothermic and which are steppic.

SI 107–109: Is this new or already published data? Please clearly indicate.

SI 120–125: Which parameters were used for the Ip analysis? Could you add Ip to the first sentence?

SI 120–137: Why were exactly these datasets used? Why is there only one analysis for HS1?

Technical corrections:

74: Please edit format of reference.

167: shown.

SI 125: Please add "(CI)" after "Confidence Interval".

SI 129: analyses.

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