

Interactive comment on “Multi-decadal climate variability in southern Iberia during the mid- to late-Holocene” by Julien Schirrmacher et al.

Anonymous Referee #4

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Schirrmacher et al. present the results of a reanalysis of two marine cores from southern margin of Iberia spanning the late Holocene and discuss the possible factors and mechanism behind the reconstructed climate variability, with a focus on the 4.2 ka BP event. While not new - provided that the chronological uncertainties are better constrained - the results of the study could improve our understanding of the spatial characterization of the climatic conditions during the 4.2 ka BP event, especially as both summer and winter temperatures are reconstructed. However, I find the discussion of the data rather superficial and the discussion of the mechanisms minimal. While I support the publication of the paper, several issues, detailed below, needs to be addressed.

- 1) Chronology and resolution. While it is claimed that the records have high-resolution, this is not evident from the data. It is not clear how many samples have been analyzed,

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especially for core 976A and what was the resolution: 0.5, 2 cm? Further, the choice for excluding several of the data points from the final age-depth model seem to be arbitrary – the exclusion of the ages with lower precision lead to further exclusions. How would the age-depth model have been if the samples with the lower precision were kept, instead (± 10 years at 4000 cal BP does not make a big difference). Further, the choice of linear interpolation has been shown to give less reliable ages (Blaauw et al., 2018). Why not using Bayesian modeling? 2) The “results” and “discussions” chapters should be better separated, some of the text under the later would better fit under the former. 3) Their seem to be multiple issues with the “alignment” of the proxies, possibly resulting form the less precise (see above) chronology. Which of the several periods is identified precisely with the 4. 2ka event? Further, given that both summer and winter temperatures are reconstructed, the discussion should be separated for the two seasons. Next, rather than assuming that the 4.2 ka event was dry in the region and try to support this by choosing one or other of the “peaks” in the data I suggest starting with multiple hypothesis and discuss them in light of your data. Several studies in the wider study region have shown that the 4.2 ka BP event could have ben wet (e.g., Zielhofer et al., 2018) during winter. 4) The mechanisms described in chapter 4.2 (“Possible drivers...”) rely more on Ausin et al. (2015) than on the data from the power. See also the comment above and the detailed comments below and try to improve the interpretation by providing a mechanistic evidence for the described processes.

Minor comments P1, L23: Dansgaard et al (1993) is outdated, perhaps some newer and better references would be better P2, L2: numerous other events are not resolved in NGRIP... P2, L12-13. I am not an archaeologist/historian, but perhaps “turnover” is not the best word to be used in this context P2, L20. Please detail the contrast P3. The word “relatively” is overused in the chapter 1.1. While Iberia is relatively cool (L2) compared to N Africa, is relatively hot, compared to N Canada. Please give the values for the temperature, it would allow readers to better understand the present-day climatic conditions. P3, L7 you mean mm instead of ml P3, L15: please detail the circulation, separately for the season, it is not clear from the text (e.g., you discuss low SST in

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the Atlantic margin and then jump to warm inflow to the Aliborean Sea...) Materials and methods: please improve the description of the sampling strategy, it is not clear what resolution you achieved in the end. Age model: see the comments above, the choices need to be better explained. A critical discussion on how a different choice of exclusions would have affected the results would be welcomed. P6, L1: ccm is cm3? P6, proxy reconstructions. Please give values for the Q for both rivers, as well as for the seasonal discharges to better understand the seasonality of alkanes in the cores P7, results: please add "cal" after ka (e.g., 4.3 ka cal BP) P7, L11: the contemporaneity should be discussed in the light of chronological issues P7 and 8, results: the entire chapter is somewhat confusing, please try to simplify it. Also, it is not clear how the various dry/cold/warm periods have been found to be contemporaneous. P8, L19: was it dry in winter or summer? See the detailed comment above P9, L11: 20 years..what is the age error here? P9, L15: winter or summer, again? Generally (I repeat myself) the discussion should be clearly separated for summer and winter P9, L25-26: not clear, the cooling trend would result in colder, not warmer SSTs P9, L25: "at that time" What time? P9, L29 and next lines on P10: for which period are these temperatures given? P10, L9: hm, the resolution problem. Was it high or low? My quick calculations show that the resolution is closer to 100 years at the time of interest... P10, L15-19: for which period does this paragraph refer to? Generally, chapter 4.1 is a mix of results and discussion, most of it should go under "results" P10, chapter 4.2.. This is the "meat" of the paper, but the discussion is quite weak. I also think that "NAO-like variability" is quite over abused. Further, if the ANO is to be used, perhaps it would be more useful to use a NAO reconstruction, rather than a storminess one, which could result from other factors than NAO (e.g., Olsen et al., 2012) P11, L15: the comparison with the IRD record is useful as long as the mechanisms linking the two are better described. Else, correlation and causality are different. Please improve the discussion by including mechanistic explanation that could result in the variability described here.

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