

## ***Interactive comment on “Historical Climate off the Atlantic Iberian Peninsula” by Fátima Abrantes et al.***

### **Anonymous Referee #2**

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General comments: Studying past ocean-climate interactions in the North Atlantic region is highly relevant for understanding the present changes and predicting future scenarios. The submitted paper nicely addresses the important scientific questions within the scope of the journal. It highlights the importance of the regional dataset in the context of large-scale phenomena. Part of the dataset is new but also includes published data and historical records of floods and draughts nicely compiled in tables and discussed. This altogether presents a more complete picture of SST changes along the Atlantic coast of Iberian Peninsula. Compilation of multiple cores and proxies makes conclusions strong and reliable. The conclusions present the essence of the main findings. The paper is well-structured and there are elements of self-evaluation of the methods used in this study which makes the interpretation of the data more objective. Abstract provides all necessary information. The paper can be accepted after

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revision which is mainly centered on organization of the text, insufficient method description and wording/use of tense/citations in text. English corrections would be very useful for a better flow of the text. There are also different fonts in the text and some yellow highlights, please work on formatting. Please double-check the citations used in text, i.e. proper use of brackets, there are often double brackets or unnecessary ones. Please be consistent with shortcuts throughout the text; use the ones given in your literature (Mann et al. 2010): Medieval Climate Anomaly (MCA); also use Roman Warm Period (RWP in Seidenkrantz, M-S., Roncaglia, L., Fischel, A., Heilmann-Clausen, C., Kuijpers, A., Moros, M. 2008. Variable North Atlantic climate seesaw patterns documented by a late Holocene marine record from Disko Bugt, West Greenland. *Marine Micropaleontology* 68(1-2): 66-83). Please make sure that you use full name of each shortcut when first mentioned in each chapter, e.g. NAO, AMO, AMOC etc.

Specific comments: Abstract: please remember to use past tense; please organize abstract better - methods before results. Please mention the proxies you use in this study in abstract (see details below, in 'technical corrections') IP - Iberian Peninsula and AP - arboreal pollen – don't use shortcut for these, there are already many shortcuts. Try and keep them to the necessary minimum and use the ones that are well known. Oceanographic conditions – don't use shortcuts for currents, it gets confusing and you don't really repeat them later in text anyway. What would be very important to show for this study is a map of currents, their distribution patterns along the coast. Please add a map to Figure 1 or modify it. The circulation system is quite complex here and hard to follow without an illustration. Material and methods – more information is needed here regarding alkenones and pollen, i.e. Total Pollen Concentration (TPC). This last information is not mentioned. Some of the methodological info are found in Discussion and they belong in Methods section (see details below). Also, be clear which cores are part of this study and which are already published. Results and Discussion – please give more information in the introduction by listing the proxies you used in this study and what these proxies are used for so the reader doesn't have to look for it in text (see details below). Perhaps you could hypothesize on the phytoplankton blooms that you

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mention on p. 8, line 7. In the northern seas they are produced mainly by diatoms and haptophytes, whereas haptophytes are mostly represented by *Phaeocystis* species. You use coccoliths in this study but please also mention other members of phytoplankton that are common during the blooms and that you don't study. Is there a possibility that *Phaeocystis* also produces alkenone-derived SST signal? Or is it just coccoliths? Chapter 5.2 – you should clarify why you have 2 separate subchapters, one for [n-alc] and TPC and then pollen separately. What is the reason for separating description of TPC from pollen? If this is a routine procedure, please explain it in this chapter and also in methods. A little work is needed on conclusions but it's ok, see details below.

Technical corrections: Title proposition: 'Marine paleoclimate of the Atlantic Iberian Peninsula' Be consistent: Kilo years – kyr, years - yr Abstract page 1: Line 18 – relevant instead of key; key points would include Arctic influence as well l. 20 – 'targets regional reconstruction of oceanic variability during the last 2 kyr. Keep it simple, also 'historic' is not a good word in this context. Fits better to archeology. l. 22 – give full name of SST. Correct sentence: 'The Sea Surface Temperature (SST) reveal long-term cooling...' l. 23 – Sites not latitudes l. 23 – 'early Holocene' – what about warming of the climate during Holocene Climate Optimum; better write 'late Holocene'. Late Holocene cooling has been described by Kaufmann et al. 2003 l. 25 – reorganize sentence: 'A multi-decadal/centennial variability has been detected within this long-term cooling trend along Iberia. l. 26 - list the proxies and correct the sentence: 'The alkenone-derived SST reconstruction combined with...' This sentence describes method, please move it before sentence in line 22. l. 28 – correct sentence: 'Regional variability is generally in convergence with other records from Spain, Europe and northern Hemisphere. Warm SST conditions...' Abstract page 2: l. 1-2 – led instead of lead and simultaneously instead of contemporaneous l. 3 – specifications is not a good term; perhaps 'climatic fluctuations' l. 8 – characterized instead of typified l. 9 – remove IP shortcut Introduction page 1: l. 17 – start with a broader introduction, e.g. 'Extreme regions, such as Arctic and Mediterranean are highlighted as most...' (you can find reference in many climate assessments) l. 27 – geological time not historical

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l. 32 – the Medieval... Introduction page 3: l. 9 – identified instead of encountered l. 16 – NAO – please mention a large-scale pattern between Europe and Greenland, seesaw pattern described in Dawson et al 2003 (Dawson, A. G., Elliot, L., Mayewski, P., Lockett, P., Noone, S., Hickey, K., Holt, T., Wadhams, P. and Foster, I. 2003: Late-Holocene North Atlantic climate 'seesaws', storminess changes and Greenland Ice Sheet (GISP2) palaeoclimates. *The Holocene* 13, 381-392.). l. 17-20 - it would be good to briefly explain how the NAO+ phase results in Mediterranean region, similarly as you write for NAO-. l. 20-22 – NAO+ during MCA and NAO- during LIA sentence – this is pure speculation without a reference. Delete the sentence or move to discussion. Doesn't belong here l. 27 – citation here and throughout the text 'according to Hernandez et al. (2015) l. 35 – sentence starting with 'Using the EOF-based..' and ending at '...explained by a NAO+ but EA-' belongs to discussion. Also correct the sentence by starting with MCA and the LIA to keep chronology. 'On the other hand' instead of 'on the contrary'. Introduction page 4: l. 5 – 'However, the ocean variability is poorly represented (only 2 existing reconstructions) compared to..' l. 14 – this instead of such l. 16 – delete 'surface' l. 19 – this is a follow up sentence, no need to start new paragraph; 'The two existing reconstructions...' l. 24 – correct sentence: 'Given the potential risk of climate-derived threats for marine ecosystems of the western Iberia, high-resolution climate archives.....to better understanding of interactions between various climate modes, future scenarios and their relevance to the Iberian Peninsula.' l. 28 – spatial not latitudinal l. 31 – 5 new records? You have 8 records, 5 sites. Which one is it? Chapter 3: Materials and methods Methods page 6: l. 5 – add sentence: 'The cores retrieved from Galiza, Minho, Algarve sites were analyzed as part of this study, whereas the rest of the core data were published in ...' l. 8 – be more specific when describing methods and use some of the info from discussion: 'The organic compounds of xxx, alkenones (i.e. Uk37)..' l. 11 – analytical error? l. 14 – 'of the Muller et al. (1998) calibration..' please provide the exact equation here. l. 16 – remove web link from text and add to reference list; here only mention name of website, lab etc. l. 25 – full name for SST when first mentioned in chapters l. 30

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– delete ‘and every’ l. 35 – ‘and Porto’ Methods page 7: l. 8-9 – exponential curve sentence – reference is missing here l. 12 – correct sentence: ‘Age-depth models of 5 records out of 8 have been. . .’ Next sentence: ‘The remaining age-depth models for the 3 cores from Galiza (xx), Minho (xx) and Algarve (xx) were constructed based on. . .’ l. 20 – what is the reservoir age error?  $400 \pm ??$  Yrs l. 21 – calendar years Results and discussion page 7: l. 25 – star this introduction with list of proxies and what they are for, e.g.: ‘In this study we present a multi-proxy approach to reconstruct past oceanic conditions, i.e. alkenones as Sea Surface Temperature (SST) proxy, xxx’ l. 28 – ‘has also been’ l. 29 – delete ‘that is’ l. 30 – delete ‘down to’ l. 32 – finish this paragraph with sth like: ‘Below we describe all studied proxies and the main findings, as well as overall forcing mechanisms identified in our sedimentary record and compared with large-scale atmospheric oscillations.’ Chapter 5.1 – delete shortcut SST from headline Discussion page 8: l. 1-2 – this sentence belongs to methods and is partly mentioned there. Start with: ‘For alkenone-derived SST proxy a local calibration. . . shows the record as spring/fall record’ l. 17 – delete up Discussion page 9: l. 3-4 – ‘colder SST’ colder than what? Previous period? Please clarify l. 8 – ‘related to’ l. 10 – add a clarifying sentence that the cooling trend of the LIA is most prominent in data from Algarve where full record for LIA is available, while other cores show either stable trends or are missing data points during this period. l. 12 – ‘SST oscillations compared to’ l. 13 – ‘coinciding with the Great Solar Maximum’ l. 14 – ‘higher global temperatures of the last 1.4 kyr’ this time frame encompasses LIA while authors argue for cooling; perhaps just delete this part, it is confusing l. 16 – correct sentence: ‘Despite. . . Algarve site, may result from higher resolution and better proxy preservation in the more recent sediments, compared to older sediment layers. . .’ chapter 5.2 should be called Terrestrial input and riverine discharge; you don’t really describe temperature here l. 24-26 – this belongs to methods, move the following part to methods: ‘lipid compounds synthesized by higher plants, such as C23-C33 n-alkanes ([n-alc])’; correct the sentence as follows: ‘The new sites (list these sites here again) lack such data, but given that Fe and n-alkanes show. . . Porto sites (xx) and a statistical significance (i.e. Pearson

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correlation. . .’ l. 27 – evaluate not qualify l. 28-30 – this sentence belongs to methods, move to methods. Instead just write: ‘Furthermore, Total Pollen Concentration (TPC) data support the interpretation of river influx to the marine environment.’ Please remember to clarify why TPC is described separately from pollen Discussion page 10: l. 4 – ‘the lower’; it’s better to write ‘low’ or ‘the lowest’ l. 6 – please delete ‘That is’ and ‘terms’ l. 8 – what has been maintained? Higher precipitation? Higher precipitation was at sites showing drop in river flux? And northern Portuguese area relative to its north and south locations? There are some contradictions and lack of clarity in this sentence, it’s also too long. Please clarify and simplify. l. 23 – ‘from oscillations in the TPC data’ – you already provide full name earlier l. 26-27 – ‘Although somewhat larger. . .’ please delete this sentence, it’s confusing l. 28 – ‘Tagus core (xx) in Rodrigues et al. (2009) shows a clear increase of terrestrial input starting. . .’ Discussion page 11: l. 13 – provide reference to a figure in this sentence l. 18 – please do not use the shortcut AP, there are too many shortcuts in text already l. 19 – ‘temperature’ – start with small letter l. 27-28 – very interesting! l. 32 – ‘into’ instead of ‘and’ page 12: l. 6 – please find a different word for ‘hamper’ l. 9 – ‘satellite-derived SST (Fig. 3)’ l. 10 – please define ‘it’ whether you mean SST or bloom l. 13 – replace ‘comparable and similar to’ with ‘in accordance with’ l. 24 – no need to start with new paragraph l. 32 – provide full name for NAO when first mentioned in Discussion, last time it was mentioned in Introduction l. 33 – please write full ‘temperature’ here l. 34 – ‘was’ not ‘are’ and please split this sentence into two, too many shortcuts here, it gets confusing page 13: l. 5 – ‘specificities’ is not a good word, maybe ‘fluctuations’ better? Please correct this sentence into: ‘climate fluctuations (discussed below), identified in. . .’ ‘and associated with. . .’ l. 6 – please give full name for TSI l. 18 – ‘resembling’ instead of ‘that is’ l. 21 – ‘and these data are in good agreement. . .’ l. 22 – delete ‘up’. End sentence after LIA and then new sentence: ‘This likely reflects similar on-land conditions in. . .’ l. 24 – full name for AMO here l. 25 – ‘intermediate seasons, i.e. spring and fall.’ l. 28 – ‘in turn’ l. 30 – specify sentence; warm waters of the MCA, one between xx and second one between. . .’ l. 32 – ‘NAO-like’ l. 33-34 – correct sentence: ‘tropical

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Atlantic, i.e. fresher water caused by.’ also, you write about evidence for lower salinities (reference is missing here). Fresher waters in your study suggest riverine input. Please hypothesize on that or clarify the sentence with appropriate reference. Typically warmer subtropical waters would be more saline not fresher, Arctic waters are fresher compared to Atlantic saline water. Please work on that sentence. ITCZ – full name is needed and also, AMOC stands for Atlantic Meridional Overturning Circulation not just overturning circulation, please be specific. Page 14: l. 4 – ‘consequently with’ l. 9-13 – starting with ‘According to..’ these two sentences belong better to introduction l. 20-21 – correct the sentence: ‘..the interannual winter variability in the northern Iberian Peninsula can be attributed to the joint influence of NAO and SCAND modes while EA appears to have weak influence on the area during summer.’ l. 31-32 – the sentence on wavelet analysis belongs to methods page 15: l. 2 – precipitation l. 5 – no need to start new paragraph l. 7-8 – ‘20-30-yr’ and ‘50-70-yr’ l. 9 – correct sentence: ‘In the NE North Atlantic Cunningham et al (2013) find 111-, 55.6-, 40- and 31.3-yr cycles’ l. 10-11 – ‘leading the authors to conclude of.’ l. 14 – ‘supporting the 70-yr.’ l. 14-16 – correct sentence: ‘In addition, ocean dynamics play a significant role in the variability of the European climate on decadal and multi-decadal scale (references here).’ l. 17 – ‘in the light of’ l. 19 – correct sentence: ‘affect SST and precipitation in the southern site of Atlantic Iberian Peninsula.’ l. 23 – ‘return of higher? SST compared to values pre.’ you did not observe these values here l. 25 – ‘and the generally northern. . .’ l. 31 – no new to start new paragraph l. 34 – delete ‘on the basis of published evidence’ not necessary as you give references anyway page 16: l. 7 – ‘variability within AMO from negative (cold) to positive (warm) phases.’ l. 10-11 – ‘the North Atlantic SST pattern on the coast of Iberian. . .’ and ‘proposed by’ instead of ‘defended’ l. 14 – ‘increase in SST in the southern. . .’ l. 16 – ‘In addition, a substantial. . .’ l. 17 – ‘southwestern’ – start with small letter; ‘50 yr’ l. 18 – ‘suggested by’ not ‘defended’ l. 23 – six sites? Not five? l. 24-25 – ‘at different time scales’ l. 27 – ‘provides’ l. 29 – no need for new paragraph; correct sentence: ‘On a long-term scale, a decreasing trend in SST from 0 CE to the beginning. . .’ l. 32 – no need for new paragraph; correct sentence: ‘Within this

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cooling a series of decadal-scale climate changes were detected following the overall climatic patterns. . .’ l. 34-35 – correct into: ‘Iberian records of arboreal vegetation and NE Spain air temperature until the beginning..’ page 17: l. 1 - ‘frequent but not extreme’ l. 3 ‘in all studies latitudes’ or ‘sites’ l. 4 – climate ‘fluctuations’? l. 6 – delete TSI, no need for shortcuts in conclusions as they won’t be repeated further l. 7 – no need for new paragraph, start the sentence with: ‘In addition, within the MCA. . .’ l. 9 – ‘the previously proposed interplay. . .’ l. 10 – ‘both of which are positive phases’ l. 12 – ‘implies’ l. 15 – no need for new paragraph page 20: l. 22 – ‘and Trouet reconstruction? (gray line. . .’ something is missing here

Table 1 & 2 – can these two tables be merged or is too confusing with radiocarbon depths? Table 1 – coordinates – please give 2 decimal points, this should be enough. E.g. 42.16 for first latitude Table 3 – the coloring (shading) is inconsistent, you use different colors for the same temperature values; there is red for Galiza for 16.0 and then below, light blue for 16.1. Maybe it would be better to color-code them according to temperature, objectively, meaning the same way for all sites and periods, such as blue for <15, pink for 15-16 and red for 16<. Then you can actually see that LIA is not that very cold in Galiza, compared to MCA in Minho. Please correct the names: Roman Warm Period, Dark Ages, Medieval Climate Anomaly, 20th century. Table 4 – very nice! And very helpful. Figure 2 – capital SST in legend Figure 3 – please explain in caption that letters in legend are months

Please also note the supplement to this comment:

<http://www.clim-past-discuss.net/cp-2017-39/cp-2017-39-RC2-supplement.pdf>

Interactive comment on Clim. Past Discuss., doi:10.5194/cp-2017-39, 2017.

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