

## ***Interactive comment on “Hydrological evidence for a North Atlantic oscillation during the Little Ice Age outside its range observed since 1850” by C. Martín-Puertas et al.***

### **Anonymous Referee #1**

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The data provided here, a 800-year long  $\delta^{13}\text{C}$  chronology, could be very useful as there is a lack of long, and high resolution, climate proxies series in the Iberian Peninsula. They could bring clues for understanding past atmospheric teleconnections and climate forcing in the Mediterranean area. In particular, the anticorrelation of the reconstructed precipitation in Spain with a North African PDSI reconstruction, if it was proved true, would raise important questions.

However, the lack of rigour throughout the paper does not leave the reader fully confident in the results: the data treatment is presented in a very meagre way; some basic information is not provided (e.g. analytical uncertainty) or elliptical (for instance,

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how the chronology was exactly constituted); some important aspects are just not addressed (e.g. the possible juvenile effect); method and results are mixed; the results part is sketchy; many references are inappropriate, aso. . . The details are provided in the following lines.

Introduction - Line 24 p4150: 'The most studied period is the Maunder Minimum . . .this cooling is thought to be related to a weaker solar output and increased volcanic activity' The Maunder Minimum is not a climatic period caused by a decrease of the solar activity but a time of decreased solar activity (see for instance Eddy,1976, Science 192).

- Line 4 page 4151 fwd: This part of the introduction is a little messy. What is your purpose in introducing the reference to the 11-year solar cycle?

- Line 7 page 4152: “suggest a drought pattern in both Mediterranean..coinciding with the Maunder Minimum” (Barriendos, 1997; . . .)” To my knowledge, Barriendos (1997) shows an increase in precipitation related to the more frequent passage of low-pressure systems over the peninsula during the MM. Rodrigo et al. (1999), not cited here, showed moist conditions at the beginning of the seventeenth century and normal precipitation between 1650 and 1725 in the South of the Iberian Peninsula. This is in contrast to the reference cited. I think the authors should have a more complete approach showing in particular the non-synchrony of droughts within the Iberian Peninsula at this time and that the second half of the 17th and the beginning of the 18th was not uniformly dry, as they suggest.

- Page 4153 Line 10 and fig 1d: why not showing local precipitation data rather than a general graph for Andalusia which may not represent precipitation at this 1800m elevation site?

Material and methods This part is VERY weak. The choices made by the author need being explained. The analytical procedure must be given in much more details. The uncertainty calculation must be provided. The part 3.2. mixes method and results. You

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must clearly separate the two.

- Page 4153 Line 16: 'sampling was carried. . .': this is already said in regional settings.
- Line 23 "Four of the collected. . .": Why do you take only four cores? What are your criterions to choose them?
- Page 4154 line 1: The similarity of the results. . ." Not only Dorado Liñan et al (2011) have addressed this issue. Please consider also: Borella et al., 1998; Treydte et al., 2001; Leavitt, 2008; Shi et al., 2011.
- The way the final chronology was built is unclear. Do you use different trees for the pre-1600 and post-1600 time period? If it is the case, you did not use only 4 trees. Why not using the same trees for the whole time period if 900-year old trees exist as stated in line 19? If it is not the case, I do not understand how you can have trees overlapping in the 1400-1600 interval. . .
- Why do you mention VSMOW as d18O is not presented and used in this paper?
- The analytical procedure must be described more precisely. What do you use as an internal standard? What is the uncertainty? Reproducibility? How many references /samples are analyzed?
- Do you separate early from late wood?
- Page 4154 Line 5: EPS is mentioned but not shown in the results. According to figure 2 the inter-tree variability is big. You must comment this in the results and report error bars on the final chronology.
- How do you deal with the d13C decline of atmospheric CO2? Are your data corrected?
- Did you test some PIN correction? How would it affect the results?
- What about juvenile effect on d13C? What part of the chronology can be affected by

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such age effect? To what extent?

- Page 4154 Line 13: You must explain how the confidence intervals are calculated (boot strap method?)
- Line 16: “d13C shows a significant negative moisture...”: these are results not method.
- Page 4154 Line 19: Andreu-Hayles et al. 2011: I cannot see that these authors say that only the precipitation signal is temporally stable. One of the conclusions of this paper is (I quote): “the results of this work did not show any clear precipitation pattern...”
- Page 4154 Line 19: “. . .has been reported for different pine species. . . (Treydte et al., 2001). . .). The Treydte et al (2001)’s paper is on spruces.
- Page 4154 Line 26: “regional correlation. . .” between d13C and? June-to-september precipitation?
- Page 4154 Line 28: Why do you choose June-to-September? Is it the growing season? The combination of months which give the highest score? Please justify.
- Page 4155 Line 2 “Pearson’s . . . from the regression” : already said at the beginning of 3.2.
- Page 4154 Line 4: “the results show strong . . .”: 0.4 is not what I would call strong. It is rather moderate. What are the p-values? The results shown in figure 3c are not very convincing.
- The regression equation between d13C and June-Sept precip should be given and the error on slope and intercept provided.
- Page 4155 Line 14: it would be interesting to have the d13C / yearly precipitation shown.

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Results This part is sketchy. - Page 4155 Line 20: “ a decreasing trend ..” It is interestingly coincident with Wolf minimum.

- Page 4155 same paragraph: To describe the curve fully and rigorously, it should be also noted that the reconstructed precipitation tends to increase during the 15th century while the solar activity curve shows a decrease (Spörer minimum).

Discussion - Page 4156 Line 7: Moreno et al, (2011) and Morellon et al, (2011) do not deal with the entire peninsula but respectively to NE Spain and Southern Pyrenees. The site studied here has a more southern location and may not be entirely comparable from a climatic point of view.

- Page 4156 Line 12: “decadal precipitation variability...” how can you deal with decadal variation while the curve is 21-year smoothed?

- Page 4156 Line 20: It is not possible to say that the Guadalentin river shows a reduced activity from 1550 to present as the record spans precisely over this time period. Reduced compared to what? Moreover, contrary to what is said, the flow number is not low during the first half of the Maunder Minimum.

- Page 4156 Line 24: “drier condition in Southern and Central Europe for nearly the entire LIA (Nicault et al., 2008)”. I disagree: Nicault et al. (2008) showed that the XVIII and XIXth, are characterized by dominant wet periods, the wettest spanning from 1670 to 1765, that is during the Maunder Minimum. According to them, this long stable and wet period (1700–1750) affected the entire Mediterranean Basin (but eastern Turkey).

- Page 4157 Line 3: Note that PDSi does not reflect only precipitation but is a combination of precipitation and temperature signal. The anti-correlation shown here is impressive.

- Page 4157 Line 19: Zveryaev et al. (2008 ) does not refer to the East Atlantic pattern but to the Scandinavian teleconnection pattern!

- Table 1: why do you express  $r^2$  in % and  $r$  in decimal numbers? The third digit for the

r2 is meaningless (21% instead of 20.9% and 17% instead of 17.1%)

Minor points - Line 4 page 4151: “a shift towards the negative Artic oscillation/North Atlantic oscillation. . .” I guess you mean negative phase

- Page 4154 Line 9: Correlations between d13C and monthly climate. . . were calculated with monthly data. . .” unnecessary repetition.

- Page 4156 line 10: “at Cazorla that”: rather: “at Cazorla than. . .”

- Page 4157 Line 7: You mean the higher precipitation in Spain occurred earlier than the lower PDSI in Morocco?

- Page 4157 Line 19: East Atlantic pattern

- Fig 2: Aug instead of UG

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Interactive comment on Clim. Past Discuss., 7, 4149, 2011.

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