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Climate of the Past Discussions

Interactive comment on "Tracking climate variability in the western Mediterranean during the Late Holocene: a multiproxy approach" *by* V. Nieto-Moreno et al.

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This is an excellent paper and a very important contribution to paleoceanography in general and to paleoclimate research in the Western Mediterranean Area in particular. The multi-proxy strategy used for this work appears to be sound and the incorporation of statistical analyses for the interpretation of geochemical data adds more value to this article. Furthermore, the focus on the last millennia is a good opportunity to compare these results with a growing number of Late Holocene continental records of the Iberian Peninsula published during the last years. Furthermore, lake sediments often display a comparatively higher resolution for this period. A good synthesis of research carried

out during the last years on this field can be found in Valero Garcés et al., (2009) and Valero-Garcés and Moreno, in (press).

However, I would like to contribute to the open discussion of this manuscript with the following comments and suggestions:

General remarks:

The traditionally used term 'Medieval Warm Period' has been progressively replaced by the more adequate 'Medieval Climate Anomaly'. Thus, I suggest using the latter throughout the manuscript.

The author compares her results with other global records, mainly W Mediterranean marine sequences and besides particular references to S Spain sequences, only with reviews of Mid-European lake level oscillations carried out by Magny (2004). The author states that NAO is the main forcing mechanism for climate variability during the last millennia in the Western Mediterranean area. According to this, opposite paleoclimatic trends could be expected when comparing N and S Europe. The location of most of the lakes reviewed by Magny, above 46°N and about 1300 km NE from the study site, makes them less suitable for comparison than other sequences from S Europe. In fact, significant contributions to the study of paleoclimatic variability of the Iberian Peninsula during the Late Holocene have been provided by continental records from Spain and Morocco and marine sequences in the Iberian Margin. The general agreement of Alboran data with these results might reinforce some of the hypotheses stated by the author, thus improving the quality of the manuscript. In fact, recent investigations demonstrate a clear correspondence between all these records during the last two millennia (Moreno et al., in prep.).

Particular comments:

p. 640, 2nd paragraph: citing a reference to support comment about the influence of NAO in the IP would be good here.

p. 647, I suggest including the full name of the climatic stages first mentioned here (e.g., DA, MWP, LIA, . . .) and their respective chronologies

p. 649, line 3, I would say 'constant' post depositional patterns rather than 'flat'.

p. 651, Roman Humid Period. Martín-Puertas et al., (2009) provided an annually resolved record of this period in Lake Zoñar and considered it as the most humid period in the last 4 ka. . . Does Alboran Sea record agree with Zoñar? Is it possible to find here internal fluctuations within this period? I think the original reference Martín-Puertas et al. (2009) should be included here.

p. 653, last paragraph. Medieval Warm Period. As evidenced in Moreno et al., (in prep.), the Medieval Climate Anomaly (MCA) was characterized by generally drier conditions in the Iberian Peninsula. Particularly dry conditions have been recorded in Lake Zoñar (Martín-Puertas et al., 2008), Estanya (Morellón et al., in press; Morellón et al., 2009), Lake Montcortés (Rull et al., in press) and Lake La Cruz (Julià et al., 1998), among others. Consistently, a decrease in flood frequency was registered in the Tagus Watershed (Benito et al., 2003, 2004; Moreno et al., 2008). References to these sequences are more adequate here than the one provided by the author, derived from the French Jura, as stated above.

p. 654, last paragraph. Little Ice Age. The previous situation is reversed in this period, which has been recorded as a generally humid period in Lake Zoñar (Martín-Puertas et al., 2008), Lake Montcortés (Rull et al., in press) and Lake Estanya (Morellón et al., in press). Higher frequency of floods in the Tagus has consistently been recorded by Benito et al. (2003 and 2004) and Moreno et al. (2008). The internal structure of the LIA and the influence of changes in solar activity have also been unraveled in some of these publications, particularly in the Tagus River ones. Taking into account the resolution of this record, is it possible to reconstruct internal variability within the LIA and its potential connection with sunspot variability or other forcing mechanisms? In fact, an initial arid phase within the LIA was also found in some of these sites (see

Morellón et al., (in press) and references therein). Again, references to some of these records would be adequate here.

Page 654, Forcing mechanisms. The decoupling between solar radiation and climate variability in this area during the MWP and LIA is a very interesting finding. According to the author, the NAO would be the main forcing mechanism for this period. Consistently, I recommend the incorporation of a NAO index reconstruction in figure 8, which fits well with this discussion. Trouet et al., (2009) provided the longest NAO-index reconstruction available to date, demonstrating anomalous positive values during the MCA, declining progressively during the more humid LIA. Parallell records instead of an overlapping of different curves would improve the quality of this figure and the incorporation of other(s) continental records cited through the manuscript would help the reader to follow the comparisons between records discussed in previous sections.

P. 656, Conclusions. If any of the changes suggested before are considered, this section should be modified accordingly.

Congratulations for this high-quality contribution to W Mediterranean paleoclimate research!!

References cited in this comment:

Benito, G., Díez-Herrero, A., and Fernández de Villalta, M.: Magnitude and Frequency of Flooding in the Tagus Basin (Central Spain) over the Last Millennium, Climatic Change, 58, 171-192, 2003.

Benito, G., Díez-Herrero, A., and Fernández de Villalta, M.: Flood Response to Solar Activity in the Tagus Basin (Central Spain) over the Last Millennium, Climatic Change, 66, 27-28, 2004.

Julià, R., Burjachs, F., Dasí, M. J., Mezquita, F., Miracle, M. R., Roca, J. R., Seret, G., and Vicente, E.: Meromixis origin and recent trophic evolution in the Spanish mountain lake La Cruz, Aquatic Sciences - Research Across Boundaries, 60, 279-299, 1998.

Magny, M.: Holocene climate variability as reflected by mid-European lake-level fluctuations and its probable impact on prehistoric human settlements, Quaternary International, 113, 65-79, 2004.

Martín-Puertas, C., Valero-Garcés, B. L., Mata, M. P., González-Sampériz, P., Bao, R., Moreno, A., and Stefanova, V.: Arid and humid phases in southern Spain during the last 4000 years: the Zonar Lake record, Cordoba, The Holocene, 18, 907-921, 10.1177/0959683608093533, 2008.

Martín-Puertas, C., Valero-Garcés, B. L., Brauer, A., Mata, M. P., Delgado-Huertas, A., and Dulski, P.: The Iberian-Roman Humid Period (2600-1600 cal yr BP) in the Zoñar Lake varve record (Andalucía, southern Spain), Quaternary Research, 71, 108-120, 2009.

Morellón, M., Valero-Garcés, B., Vegas, T., González-Sampériz, P., Delgado-Huertas, A., Mata, P., Moreno, A., Rico, M., and Corella, J. P.: Late glacial and Holocene palaeohydrology in the western Mediterranean region: the Lake Estanya record (NE Spain), Quaternary Science Reviews, 28, 2582–2599, 2009.

Morellón, M., Valero-Garcés, B., González-Sampériz, P., Vegas-Vilarrúbia, T., Rubio, E., Rieradevall, M., Delgado-Huertas, A., Mata, P., Romero, Ó., Engstrom, D. R., López-Vicente, M., Navas, A., and Soto, J.: Climate changes and human activities recorded in the sediments of Lake Estanya (NE Spain) during the Medieval Warm Period and Little Ice Age Journal of Paleolimnology, doi: 10.1007/s10933-009-9346-3, in press.

Moreno, A., Valero-Garcés, B. L., González-Sampériz, P., and Rico, M.: Flood response to rainfall variability during the last 2000 years inferred from the Taravilla Lake record (Central Iberian Range, Spain), Journal of Paleolimnology, 40, 943-961, 2008.

Moreno, A., Pérez, A., Frigola, J., Nieto-Moreno, V., Rodrigo-Gámiz, M., González-Sampériz, P., Morellón, M., Martín-Puertas, C., Corella, J. P., Belmonte, Á., Cacho, I.,

Canals, M., Jiménez-Espejo, F., Martínez Ruiz, F., Vegas, T., and Valero-Garcés, B. L.: The Medieval Climate Anomaly in the IP reconstructed from a compilation of marine and lake records Global and Planetary Change, in prep.

Rull, V., González–Sampériz, P., Valero-Garcés, B., Corella, P., Morellón, M., and Giralt, S.: Vegetation changes in the southern Pyrenean flank during the last millenium in relation to climate and human activities: the Montcortès lacustrine record, Journal of Paleolimnology, in press.

Trouet, V. r., Esper, J., Graham, N. E., Baker, A., Scourse, J. D., and Frank, D. C.: Persistent Positive North Atlantic Oscillation Mode Dominated the Medieval Climate Anomaly, Science, 324, 78-80, 10.1126/science.1166349, 2009. Valero-Garcés, B., and Moreno, A.: Iberian lacustrine records: responses to past and recent global changes in the Mediterranean region, Journal of Paleolimnology, in press.

Valero Garcés, B., Morellón, M., Martín Puertas, C., Moreno, A., Corella, P., González Sampériz, P., Rico, M., Mata, P., and Navas, A.: A paleolimmological perspective of three karstic lake (Taravilla, Zoñar and Estanya): Sedimentological and hydrogeological evolution climate and human impact and implications for management and restoration policies, Boletín Geológico y Minero, 120, 479-496, 2009.

Interactive comment on Clim. Past Discuss., 7, 635, 2011.