

## ***Interactive comment on “A multi-proxy perspective on millennium-long climate variability in the Southern Pyrenees” by M. Morellón et al.***

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General statements. This paper reviews the multi-proxy records at the Southern Pyrenean region. Lake records are well explained both in terms of sedimentary records and dating. Other records, such as glacial advances are mentioned, but it is difficult to learn how/where those advances were observed and dated (including the number of dates to support some of the glacial advance phases). The dendro-climatic data is also quite limited. I could imagine how difficult can be explaining the present day with one or two rainfall stations. I understand that this is the available data, no complains. However, some paleoclimatic and hydrological interpretations are either vague or sometimes go further than what data are indicated. Some terms related to moist conditions including “higher humidity” are ambiguous, and it may mean more rain or more positive water

balance. When possible, the authors are asked to be more rigorous with this terminology.

Although in general terms I agree with the interpretations based on the reported records, the chronological resolution doesn't allow providing some details into climatological variables. For instance, very cold temperatures frozen the Ebro River are only possible under very dry winters, where anticyclonic conditions are established in central Europe bringing very cold wind into the NE part of the Iberian Peninsula. Therefore, the coldest periods may not bring the higher humidity. North Atlantic Oscillation brings humidity towards the Iberian Peninsula, particularly during its negative phase. Moreover, the Ebro Basin is not the more sensible region of the Iberian Peninsula in terms of extreme NAO episodes. Moreover, there is not a direct relationship between NAO mode and climate conditions, and therefore, not all the LIA was dominated by negative mode or the MCA were dominated by positive phase. The authors do not have enough data to support these direct relationships between NAO and climate.

The paper deserves publication, but the authors may consider the following detail comments.

3051 Line 1 Reformulate sentence: This paper review well-dated, multiproxy paleoclimatic records from lacustrine, dendrochronological, and geomorphological records to characterize the main environmental changes occurred in the Southern Pyrenees during the last millennium.

3051 Line 3. Please, indicate the period of which is defined the MCA (MCA, 1000?-1300 AD),

Line 9: The following sentence seems very ambiguous: Transition: moist and cold, and Second period coldest and higher humidity?? In addition, the second period of LIA finish in 1850, and few lines before it was indicated that LIA covered 1300-1800? Please, be consistent..

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“Two major phases occurred within this period: (i) a transition MCA-LIA, characterized by fluctuating, moist conditions and relatively cold temperatures (ca. 1300 and 1600 AD); – (ii) a second period, characterized by coldest conditions and higher humidity, coinciding with maximum (recent) glacier advances (ca. 1600–1850 AD).”

3056 line 1. The following sequence is rather very ambiguous, and rather speculative. As a person working on paleorecords it is not as easy as indicated here.

You may want to say: In this study, comparison of multi-proxy reconstruction of climatic and environmental changes provided evidences to discern between climate and human forcings in landscape changes.

Although anthropogenic activities often imply similar modifications in the landscape to those produced by climatic variability, comparing different type of data and employing a multidisciplinary methodology in palaeoenvironmental sequences, allows to discern between both climate and human forcings (Moreno et al., 2008; Morell'on et al., 2011; 5 Rull et al., 2011).

3057 Line 15. Corella Aznar, 2011 and Corella 2011 is the same author?

3058. Line 18. What does IP mean?. If you mean Iberian Peninsula better to write it in full.

Check author's name.

3059. Line 25 Is the following sentence in contradiction to the previous records??: Sedimentological and geochemical signatures for the last 200 yr are coherent again with lower lake levels and drier climate conditions, although some relatively humid intervals (e.g., 1900–1970 AD) occur.

How are you able to distinguish the period 1900-1970 in the lake record??

3060 Line 22. IP??

3065 line 3 delete nearby

3065 line 4-5 change “increased humidity during this period” to “increase stream flow activity”.

3066. lines 1 to 15. I agree that moisture conditions may start early, in particular in the Ebro basin. Frequent floods occurred between 1300-1350 in both Pyrenean and Iberian rivers, mainly during autumn and spring. Not so much in winter. Probably, the whole annual hydrological balance started to be positive even if winter rainfall was not too high. Check the following paper: Benito G., Machado, M. J. and Pérez-González, A. (1996). Climate change and flood sensitivity in Spain. Geological Society of London, Special Publication n° 115, pp. 85-08.

3073 Line 18 LIA (1300-1850?)

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