

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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The authors are aware of the difficulties derived from the comparison of different sources of proxy data (tree rings, glaciers, lake sediments and pollen), characterized by different responses to climate change and also by time resolutions, ranging from annual (varved lake sediments, tree rings) to decadal or multi-decadal. In section 3 we provide specific explanations of the interpretation of each particular sequence and the main proxies analyzed in each case. However and according to the suggestion of Reviewer 1, a specific section providing a critical assessment of how each of the proxies studied here respond to climate change will be introduced in the revised manuscript. However, we do not agree with reviewer's interpretation of pollen as the potentially “least reliable” climate proxy. Although in recent times, it is no easy to discern if veg-

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etation changes respond to climatic or anthropogenic forcings, or both, the application of multiproxy strategies and not exclusively pollen data, validates our interpretations. The coincidence of several lines of evidence about paleoclimate changes is essential to support the climatic forcing of the main vegetation changes and it has been also used as a criterion for the selection of the sequences reviewed in this paper. If we have independent proxies and all of them record similar changes, at the same time, in different geographical locations, why pollen is particularly the least reliable? ‘Traditional’ literature established human activities as the main forcing of vegetation changes during the last millennia but... why vegetation changes are also in agreement with climate variability? It has been demonstrated in recent research carried out in the Iberian Peninsula (i.e., the mentioned in the paper Moreno et al., 2008; in press and Morellón et al., 2011, among others), that pollen records have recorded the main climatic trends in the region, despite human activities exist. It is also noteworthy that, as Reviewer 1 indicates, climatic trends are easier to be identified in pollen records from mountain regions (high altitude sites) than in lowland sites because human impact is reduced or absent in the first ones. Our interpretations have considered the potential impact of anthropogenic forcings (deforestation, farming) and only the main evolution trends have been described in this paper. In addition, these human activities are also frequently determined by climate, and thus, both, vegetation and human activities often display a similar variability (see Pérez-Sanz et al., in press). 2) Unfortunately, the lack of multi-proxy late Holocene records of climate change in the Northern slopes of the Pyrenees makes not possible a review of recent climate variability in the whole region. Only paleoenvironmental sequences available are peat bog, exclusively pollen-based sequences that lack an adequate chronological resolution and that interpret recent vegetation changes in the region to human activities. 3) Following the reviewer's advice we will consider the incorporation of mapped summaries of selected time slices and 4) Minor corrections will be also carried out.

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