

Interactive comment on “Contrasting patterns of climatic changes during the Holocene in the Central Mediterranean (Italy) reconstructed from pollen data” by O. Peyron et al.

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First reviewer

1) Title: Considering the location of Lake Ledro, I suggest the authors to reconsider the title of the manuscript. An option might be: Contrasting patterns of climatic changes during the Holocene across the Italian Peninsula, reconstructed from pollen data:

corrected

2) The Introduction is well structured and it is possible for the reader to follow the scope of the manuscript. I would only suggest to expand the section of the complexity

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of the Mediterranean climate (lines 5, 6), explaining why is so complex and citing more papers: OK, following sentences have been added in the introduction:

The Mediterranean region occupies a transitional zone between mid-latitude and subtropical climates. The Mediterranean climate is commonly defined by wet/mild winters and dry/warm to hot summers but large areas within the Mediterranean do not share this Mediterranean climate. The presence of strong mesoscale features that determine large climatic gradients within a region is one of the characteristics of the Mediterranean region, which would, otherwise have a much more homogeneous climate (Lionello et al, 2012). Climate in the Mediterranean region is characterized by both large spatial variability and large temporal variability. The Mediterranean lies at the boundary of high-latitude atmospheric circulation and subtropical circulation, which is linked to the summer monsoon and trade wind activity (Trigo et al., 2006). The north-western Mediterranean is under the influence of mid-latitude climate regimes, while the Asian and African monsoons, controlled by tropical and sub-tropical circulation, are more important in the central and eastern basins area (Lionello et al., 2006). In addition to atmospheric circulation and physiography, the Mediterranean Sea is itself an important source of moisture and a heat reservoir for the region. Given these factors, the regional response to large-scale climate forcings is complex (Giorgi and Lionello, 2008).

3) Sites and data. Diagrams of mean temperature and precipitation of each locations would help to synthesize these data and to compare them more easily:

OK, we have changed the figure 1 with new diagrams of mean temperature and precipitation obtained from closest meteorological stations.

4) Climate reconstruction methods. This section is well organized and it is possible to fully understand the methods used by the authors. However, I noticed that no words are spent to disentangle an important issue. As the authors stated in the description of the paleoecological history of the sites, from the Mid to the Late Holocene a strong human impact affected the natural vegetation around at least three sites. . .I would like the

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authors to spend some words to explain how this is relevant and if this can somehow affect the pollen-based climate reconstruction.

We have added in the Lake Pergusa description:

Forested landscape around Pergusa opened at ca. 5500-5000 cal BP (Ortu et al., this issue). Although ancient pre-Greek, culturally evolved, civilizations were present in southern Italy since the early Holocene, agricultural activities indicated by *Secale*, *Linum* and *Vitis* pollen are only recorded at Pergusa after 5000 cal BP. Human activities become more marked at 3000 cal ky BP, and increase significantly over the last millenia. The landscape, as indicated by pollen, over the last millenia is clearly influenced by human impact more so than by climate with clear increases in olive-tree, walnut, chestnut and cereal cultivation (Ortu et al., this issue).

We have also added in the part "Validation of the methods and error calculation" :

Non-climatic factors may also affect pollen assemblages during the Holocene. Human impacts in particular have affected the natural vegetation of the Mediterranean since ~7500 cal BP, but disentangling climatic and anthropogenic causes of vegetation change is complex. For example, both human activity and climate may have resulted in the apparent aridification in Sicily and across the Mediterranean basin at 3500 cal BP (Ortu et al., this issue). While pollen records may be susceptible to change from anthropogenic effects, previous studies show that human impacts on Mediterranean vegetation (using pollen as a proxy) are often hard to detect prior to the Bronze Age (Sadori et al., 2011; Mercuri et al., 2012). While human influences in the last 3000 cal BP are non-negligible, an unequivocal, widespread human signature in this region only begins in the Roman period. Given this, it is likely that human impacts may influence pollen-based climate reconstruction, but the precise nature of these biases is difficult to assess due to a lack of pollen and climate data from "undisturbed" vegetation. Regardless of the extent of human influence, pollen-based climate reconstructions appears to show robust results through time, particularly when other proxy data from stable iso-

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topes, speleothems, tree rings or lake-levels are used. Thus we combine a multi-model approach for pollen reconstructions with data from multiple proxies to provide broader support for our findings.

Second reviewer

1) On page 5824 : The description of Lake Ledro needs to refer to the papers submitted by Vanniere & co-authors and Simmoneau & co-authors (same special issue) :corrected line 15 :the word "deep" is inappropriate: changed by "profundal" line 20 : 66 yrsample-1 seems to be too accurate: "approximately" has been added

2) The Lake Accessa is located at 42_N, right in the middle of the North-South transect from Sicilia/Calabria to the alpine/italian lake district. What does it mean exactly in terms of actual climate mediterranean boundary? The lake Accessa is close to the eastern shore of the Tyrrhenian Sea but experiences a typically Mediterranean climate; lake Accessa is located in the Mediterranean stricto sensu biogeographical zone (Quézel and Médail, 2003). Does it make sense in the scope of this paper or can we imagine an interpretation of contrasting patterns without taking into account this Tuscany record? Magny et al (2012) assume that Lakes Accessa and Ledro show a similar lake-level pattern during the Holocene, which contrast to the pattern inferred from the sites located southward. Therefore, yes, we think that it make sense to keep this site as a control point even if it located in the middle of the North-South transect.

3) Authors never mentioned the cover and vegetation changes due to human activities. However some papers dealing with metallurgy in Italy suggest a deforestation and a probable anthropic forcing of the forest development: see reply point 4, first reviewer

4) The North-South partition pointed out by the authors is directly linked to the midlatitude climate system at a synoptic scale. Therefore, a synthetic figure/scheme explaining the probable evolution of the atmospheric pattern and circulation features could be of benefit to the reader.

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We propose to refer to the synthesis written by Magny et al, same issue.

Very sincerely

Odile Peyron

Interactive comment on Clim. Past Discuss., 8, 5817, 2012.

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