

**Review: Late Holocene vegetation changes in relation with climate fluctuations in Languedoc (southern France) by J. Azuara et al.**

This paper presents the findings of original palynological research on a composite core sequence from the Palavasian lagoon system in southern France. The methods are sound and the new pollen diagram is well supported by a robust chronology and cross-proxy comparisons with previous research on the same cores. The interpretation of the findings is well grounded in regional ecological perspectives and supported by reference to a wide range of relevant literature. The paper is well-written, concise and clear, and the figures clear and useful. In my view, the particular value of the study is evident in (i) the decadal to centennial temporal scale of the pollen record, (ii) the extension of the record up to present day in good detail through the composite sequence approach, (iii) the good level of integration with anthracological, archaeological and historical data. The paper represents a valuable contribution to the palaeoecological and palaeoclimatological literature for the southern France region, with implications for wider western Mediterranean. The paper is suitable for publication in *Climate of Past*, with minor recommendations and corrections:

Thank you very much for your comments and advices. We answer below each of your comments

4124 (abstract and throughout) -the term "The Antiquity" is not used in English, and should be replaced by "Classical Antiquity" (without "the")

*Corrected*

4124 Line 25 - change "especialy, concerning" to "especially concerning"

*Corrected*

4125 Line 3 - change to "is a crucial issue"

*Corrected*

4125 Line 12 - change to "remains a challenging"

*Corrected*

4127 Line 13 - discrimination of pine pollen is indeed possible (e.g. Desprat et al., 2015) but is not possible using routine techniques - this point should be corrected

*Corrected*

4128 Line 7 - "repetitive marine influence" - this word choice is ambiguous in meaning- please change, e.g. to "recurrent marine influence" (i.e. fluctuating, repeated) or "constant/continuous marine influence"(i.e. throughout the whole interval)

*Corrected*

4129 Line 17 - please specify what is meant by "dominant taxa" here and why they are excluded - is this referring to local marsh vegetation?

*Sorry this was not clear. We just wanted to explain that we followed the rules of Berglund and Ralska-Jaciewiczowa (1986) for pollen counting but actually there is no dominant taxa in the sequence and thus no taxa was excluded. We corrected to make this sentence clearer.*

4129 Line 19 - were the proportions calculated on the "total sum of identified grains" as reported, or on the basis of the "main sum" as defined in Line 17? Please clarify

*The proportions were calculated on the total sum of identified pollen grains, thus excluding spores and NPP. We clarified the text.*

4131 Lines 19-25 (and elsewhere) - here the aridification trend is reported as beginning at 3000 cal BP, but elsewhere in the text, e.g. Conclusions, is reported as beginning at 4600 cal BP. In my experience working particularly in the Iberian Peninsula, my understanding is that enhanced moisture and precipitation of the mid-Holocene does not extend to 3000 cal BP, but that aridification trends are evident from 5000 cal BP or even earlier (e.g. Fletcher et al, 2007; Carrion et al., 2010, and other papers already cited by the authors here, e.g. Perez-Obiol et al., 2011, Jimenez-Moreno et al., 2015, etc...). The authors should clarify their views and make the text internally consistent.

*Corrected. We modified this paragraph as suggested to make our text internally consistent and with an aridification beginning around 5000 cal BP, as shown by our data and the articles cited.*

4132 Line 25 - the mechanistic link between decreasing summer insolation and reduced winter precipitation should be briefly specified in this sentence

*Corrected. We added more information about the mechanism of this climate change :*

*“This aridification trend has been linked to a decrease in summer insolation which could have resulted in reduced lower sea-surface temperatures, reduced land-sea contrast and thus lower precipitation during the fall-winter season (Marchal et al., 2002; Jimenez Moreno et al., 2015).”*

4133 Lines 1-5 - the inferred link between basin size and pollen catchment area would depend on a main vector being atmospheric deposition over the basins. Can the authors discuss briefly, or are there any previous studies relating to, pollen transport vectors into the Palavasian lagoon, and whether waterborne pollen via fluvial and tidal sources is likely to be important? Does this have any bearing on the interpretation of the record?

*Corrected- We add a short discussion about this issue. We were not able to detect any fluvial or marine influences (aside the storm events discussed). Thus we assume that the main pollen transport vector is wind.*

Section 5.2 - regarding timing and interpretation of arid episodes, the paper should cite Fletcher et al., 2013 - within chronological uncertainties, there are parallels between the records, and the NAO interpretation is developed in detail in that paper.

*Corrected. We compared the results of the paper Fletcher et al 2013 to our data and added it to the citations of this paragraph.*

Section 5.2 - regarding similarities and differences between the clay mineralogy and pollen records, it may be interesting to consider the proxy-specific response times to the different aspects of climate change (storminess, aridity) inferred as part of a prevailing NAO-like oscillation

*We tried to explain our results considering possible differences in response times and also threshold effects, however it was difficult to explain all the observation consistently in this way. We planned to write a more detail article when the entire sequence of 7500 will be available. It will be possible to address more rigorously this issues using appropriate mathematical tools.*

4141 Line 17, 18 - change "(T)/the reforestation" to "reforestation"

*Corrected*

Section 7 Conclusions - regarding the arid events, I would recommend that the authors summarize here also the phasing with previously reported storm events and their interpretation regarding NAO dynamics

*Corrected. We completed the conclusion as suggested.*

4143 Line 24 - correct spelling of "Michelle Farrell" in acknowledgements!

*Corrected*

Table 1 - the authors should consider adding an additional column with ages in BC/AD - this will be helpful for the reader (especially if working in historical/archaeological contexts).

*Corrected*

Figure 2 - correct spelling of "riparian"

*Corrected*

Figure 3 - the caption should directly state the significance of the shaded bars (1,2a,2b,3); perhaps I missed something but I am confused by the labelling of "a","b",..."g" inside the diagram - these should be clarified in the caption, and an alternate system "i","ii" / "A" "B" etc should be used to avoid confusion with the labelling of the different records/proxies in the axis labels - or perhaps these can be deleted altogether? As the main interpretive diagram of the paper, it could be furthermore useful to add a second (BC/AD) timescale, and label the archaeological/historical periods discussed throughout the text.

*Corrected*