

Interactive comment on “Vegetation history and palaeoclimate at Lake Dojran (FYROM/Greece) during the Late Glacial and Holocene” by Alessia Masi et al.

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This is a high resolution and important paper adding new evidence of vegetation changes under climate and human actions in the eastern Mediterranean. Pollen data are precise and detailed, and the interdisciplinary research has high potentiality to deepen the palaeoenvironmental changes of the region. The complexity of results is largely described in the relevant section. The discussion needs some further comments by avoiding loss of information or partial consideration of the interlaced nature-culture dynamics involved here as in other Mediterranean sites. The pollen diagram is exceptionally useful to follow climate oscillations in the region, to understand the veg-

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etation dynamic of a conservative site, and also provide some interesting information on the presence of past cultures in the area. The paper is highly recommended for publication on Climate of the past, after addressing the following points:

Abstract: it is well written and interesting, I suggest however to strengthen the importance of the new data obtained from this high resolution and multidisciplinary study. The last sentence “The Lake Dojran multi-proxy analysis including pollen data provide a valuable contribution to the palaeoenvironmental reconstruction and the comprehension of the past vegetation dynamics of southern Balkans.” is quite general and vague while it should be more useful to add some concrete details on the contribution.

Pag. 2, line 1 and 5 = “understanding past climate and its evolution” : this sentence is not linked to the next paragraph where you introduce ‘vegetation dynamics’; I suggest to change the first sentence as “understanding past climate changes and vegetation dynamics”.

Pag. 3, line 7 = smallest Line 27-31= put latin names in italics; line 34 = ‘sylvestris’

Pag- 4, line 20 = delete ‘only’; line 29 = please, specify the main pollen sum for percentage calculations (all pollen? total land pollen?) Pag 5, lines 15-25 = check, some parts seem methods rather than results

D1 = gradual decrease of Artemisia and increase of Quercus = LateGlacial phases; fragmented Pinus = alluvial deposits?

Pag. 6, line 32 = Pinus 15% does not indicate a local grow of pine trees

Pag. 7, zone D4 = there is the disappearance of Ephedra, decrease of Artemisia, end of Centaurea, presence of Alisma (and sensible decrease of Betula); Galium and Filipendula has the last high values and then will decrease in the next zone = most pollen evidence points to a wet phase, but from your text it seems that this relies on sedimentological data (“According to the sedimentological data, this time period was characterized by increasing humidity in particular during summer.”)

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Pag. 7, line 28-29 = “The rising AP% in zone D-3 to D-5 is paralleled by a decreasing trend in the average chain length of vascular plant n-alkanes, also indicating increasing arboreal vegetation” = this sentence is not useful here or should be reformulate/completed: practically, you write that ‘rising AP’ indicates ‘increasing arboreal vegetation’ and refer to the n-alkanes curve without figure citation (and the reference to published paper is some pages before). I think that here (in the result section) you should point to the increase of Quercus, Abies, Pinus which give a great contribution to this gradual increase matching the rise of wet (and cool?) conditions. In general, in the result section, I suggest to point to your palynological data to obtain palaeoclimatic /palaeoecological inferences because data are strong and clear.

Pag. 8, line 9 = cereal traces are present even before; you have ‘Cerealia type’ pollen grains that may belong to wild species with large pollen – you should mention this in the method section, and therefore probably the term ‘Cerealia type’ may be more appropriate to this case than others

Pag. 8, line 24 =” Cereals (>0 %)” ?

Pag. 9 Vitis was high even in D6 OJC+Vitis? = I do remark that the OJC group (Fig. 2) shows a clear trend in your diagram (if Olea+Juglans+Castanea are summed up, the curve has a clear increase at around 2500 BP, to which they contribute in this order: first Olea, then Juglans then Castanea) while the scattered curve of Vitis has not the same sharp difference between the ‘before’ and ‘after’ the 2500 BP. The Vitis curve is not comparable and has not the same significance of OJC: I cannot agree with your sentence “These four taxa show slightly different behaviours and are sporadically present since the early Holocene.” because it is not what we see in the diagram

Pag. 10 line22 = “Fluctuating presence of coniferous and deciduous taxa in glacial periods is recorded in several lakes” : Fluctuating presence of (coniferous and deciduous) taxa is recorded during the Late Glacial oscillations. Don’t you have a Bolling/Allerod – Younger Dryas wet-warm/dry-cold oscillation in your zone D1? Also, of interest,

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is that you have a sharp increase of AP curve (D2) but then (D3) each tree (*Quercus*, *Rosaceae*, *Ulmus*, *Juniperus*, ...) has a gradually increasing curve meaning that this is truly a vegetational (rather than floristic) reply. This gradual increase matches the gradual decline of the steppe of *Artemisia*+*Am*/*Chenopodiaceae* showing a fairly conservative-resilient ecosystem that characterises this area and many lakes you cited.

Pag 12 lines 1-3 = as you mention Bronze Age, and Neolithic, please, put the relevant millennia in brackets to show the chronology of these phases

“The introduction of *Juglans* in the Balkans is usually dated at ca. 3000 yr BP (Sadori et al., 2013).” = do you mean that the earlier pollen record is found at c. 3000 BP in another lake? Please, explain and then: “In this frame, the early presence of walnut “... in your Dorjan record?”

Line 14: “In central Italy, a decrease in humidity, detected soon before 4000 yr BP, is found in low-stand lake levels (Giraudi et al., 2011) and in speleothems (Zanchetta et al., 2016).” Possibly this could be more related to the trends of some pollen curve of your record. I noted that your diagram shows a very similar trend to what I find in the Adriatic core RF93-30: The fall of *Quercus ilex* type occurred in core RF93-30 at around 4130 cal. B.P., and it is contemporary with both the rise of deciduous oaks (your *Q. cerris*, I mean) and the thinning of *Abies* and *Juniperus* type (this latter is less evident in your record) “ (Mercuri et al. 2012, p. 362). The dryness trend in the marine record, however, also caused a gradual decrease of *Fagus*

Line 26: I suggest to revise the consideration of *Vitis* as unambiguously included in the ‘cultivated taxa’ - look at your *Vitis* curve

Line 27 = “Mercuri et al. (2013) introduced the OJC (*Olea*, *Juglans*, *Castanea*) sum to estimate the rate of human impact on natural ecosystems” – the sum was firstly calculated to follow the development of cultural landscape in central Mediterranean (see also Mercuri 2014 Landscape Ecology, and also for the on site/off site record interpretation). The human impact was especially investigated by the API sum (Anthropogenic

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Pollen indicators; Mercuri et al. 2013 *Annali di Botanica*) which calculate the percentage sum of the seven pollen typologies found in archaeological site layers: the API sum indicates the flora which is common (ubiquitarian) near the sites where humans lived.

Line 19 = are your pollen grains Cichorioideae or Cichorieae ? according to the paper by Florenzano et al 2015, only Cichorieae have fenestrate pollen

Line 22 = You mention that “The strong human activities consisting in livestock farming, fire use, cultivation, overlapped the natural changes of LIA. “ but the trends of your pollen curves are not all evidences (again, and also) that there was an impressive resilience in vegetation dynamics of this area?

Line 28 = this is the second time you refer to Paspalum and Phragmites: I know that it is possible to identify Phragmites, but is it also reliable to identify Paspalum (put it in the methods)? If you, however, are referring to the modern vegetation you know from vegetation papers, please specify and change a bit the sentence

Pag 13, Line 6 = “found also in other sites”: mention these sites or delete these words, as you have just said the same thing in the previous sentence. In general, you said several times that you compare data but there are sites that are present only in the figure and not mentioned in the text. A general comment referring to the figure 5 – also outlining the remarkable similarities or dissimilarities – should be added as a conclusive consideration of peculiarities and relevance of Dojrian. The different elements visible in the diagram should be distinguished in the final sentences, describing the importance of this off-site record. Also, I suggest incorporating in the conclusions a comment on gradual trends, and resilience

Minor typos ‘Mediterranean’ with capital letters (?) Legend of Fig. 4 = Buxusù

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