

## ***Interactive comment on “Abrupt climate variability of eastern Anatolia vegetation during the last glacial” by N. Pickarski et al.***

**Anonymous Referee #2**

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This is an interesting and important contribution to the existing high resolution archives of vegetation history through the last glaciation and, coming from the region east of the Mediterranean, fills a geographical gap in the existing body of knowledge. It represents a significant increase in resolution relative to previous palynological data generated from Lake Van and as such has the potential to improve our understanding of how terrestrial ecosystems east of the Mediterranean responded to the abrupt climate oscillations that occurred in the North Atlantic during this interval. However, there are a number of weaknesses in the manuscript and, in light of the significance of the data, I'd like to recommend some additions and edits (below) which should help to make the most of this great dataset. In general, the manuscript would be improved by: 1) placing the work more clearly in the context of the existing body of knowledge, 2) improving the clarity of discussions about vegetation and climate change mechanisms

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(particularly the distinction between drivers and responses, and between inference and assumption), and 3) providing a more critical approach to the chronology, stratigraphic framework and correlations with existing records. There are also numerous grammatical errors which need to be corrected for the sake of clarity of the text, the most important of which are also indicated below (though there is not time to mention them all, and the manuscript will need a thorough proof-read).

Page Line Comment

3342 8 Should read “expansions and contractions of tree populations” (presumably)

3342 10 Recognition of the same pattern does not “provide a linkage” – there must also be the suggestion of (and justification for) an underlying mechanism.

3342 11 Are the periods of reduced moisture availability based on the pollen record or some independent measure of climate? Also, on what basis is the correlation with North Atlantic IRD and SST made?

3342 15 “. . . recognised by. . .” does not make sense. Should this be: “explained by”?

3342 16 You say the expansion of temperate species was “stronger” . . . stronger than what/when?

3342 23 “enables the shed light” doesn't make sense. “Should be “enables us to shed light”?”

3343 12 “steadily” should be “steady”, or perhaps “gradual” would be more apt.

3343 20 “extend” should be “extent”

3344 1 The reference to central and eastern Mediterranean records does not match the presence of western Mediterranean records in the list of references in lines 6 and 7.

3344 17 “has” should be “have”

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3344 25 “and its regional response on vegetation” does not make sense. Do you mean “the response OF vegetation” or something else?

3345 9 Should read either “The present day climate of. . .” or “Present day climatic conditions in. . .”. “Climate condition” as a phrase does not work (it occurs numerous times through the manuscript).

3346 10 Please clarify – what is the “lake floor-no event”?

3347 2 it would be very helpful to the reader to emphasise here the improvement in resolution that this study represents over existing data.

3349 11 “dominating” should be “dominated”

3349 13-14 it is conventional (and clearer) to separate the description of the results from interpretations (i.e. “in response to highly variable climatic conditions” may not belong in this section).

3349 General comment about the results section: it struck me as odd that no results appear under the headings of stable isotope analysis or profiling measurements since, although I realise that these are presented in an earlier publication, they do appear in the methods section which is perhaps a bit incongruous.

3350 12-18 Evidently, the abrupt millennial-scale oscillations with which much of this paper is concerned are not directly forced by Milankovitch (orbitally)-driven changes in insolation. Please can you incorporate into this section something about the relationship between millennial-scale (i.e. sub-orbital) climatic change (and its drivers) and orbital-scale climatic change (and its drivers)? As it stands, these lines are extremely confusing.

3350 18 Please define “steppe forest”. I am familiar with the term “wooded steppe” from earlier work on biomes, but what is a steppe forest and how does it differ, if it does?

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3350 19 Please describe the basis on which “major interstadials” have been identified. Are they chosen (and identified as “major”) on the basis of the pollen record here, or Greenland ice core records, or some other way?

3350 21 This sentence is confusing (especially “small compared to the major changes” – difficult to understand since it is not clear how small or major are defined) – please can you reword it to make the meaning clear?

3351 General comment: It would be very helpful to see inserted here (before section 5.1.1 I think) a critical discussion of the chronology and an explanation of the basis for correlation of the pollen record with the Marine Isotope Stratigraphy.

3351 4 “indicates low amplitude of temperate taxa” does not make sense. Should this be “correlates with low values for temperate taxa”?

3351 6 “As a result of insolation. . .” this sentence does not make sense.

3351 12-14 Please explain more clearly. You say “In accordance with MIS 5e” but I am not at all sure what is meant by that as later in the paragraph I think you say that 5c is very different to 5e.

3351 25 “providing” in this sentence is the wrong word – whole sentence needs to be reworded more clearly.

3351 28 “less” should be “lower”

3352 5 “resolved” should be “resolve”

3352 12 There is a tendency throughout to mix up discussion of patterns in the pollen with inferred patterns in the vegetation. There is an example here: pollen percentage or concentration curves can show low (or high) amplitude change but expansions of grassland across a landscape cannot really be said to have “low amplitude”.

3352 17 Should this read “assumption”? Is it not an inference based on the evidence?

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3353 4-7 This is not strictly correct “the total absence of temperate species. . . “ does not “suggest that woodlands. . . are restricted to refugia”. Their rapid return to the site in response to short-lived warming might suggest this, but their absence does not suggest anything but their absence.

3353 29 Should read “contraction of tree populations”

3354 5-6 This statement does not make sense to me: “From the evidence of the pollen record, we can infer direct influence of global ice sheet volume. . .” and so on. Please explain more clearly.

3354 18-19 The topic of offsets between the pollen record presented here and the NGRIP sequence needs to be addressed in more detail – please expand on this sentence, perhaps in a dedicated section.

3355 4-5 Needs an explanation of how this “increased seasonal contrast in insolation” would affect regional climates and vegetation.

3355 20 I think this section 5.3 should be within the section above.

3356 6 Which region is “this region”? Ambiguous as it stands.

3356 12-18 I think I see what you mean here, but it is quite confusing as you describe “minor drops in tree pollen” and “massive reduction of tree taxa” seemingly in reference to the same climatic events, in a way which sounds contradictory.

3357 22 I think the paper would benefit from more discussion (at least description) of the nature of the migrational lags alluded to here. This would be one way in which to make more of the high resolution data set presented here.

3357 25 A grammatical problem here: “. . . as well as due to their geographical location. . .” does not make sense.

3358 17 Should read “cannot be clearly distinguished”

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Interactive comment on Clim. Past Discuss., 11, 3341, 2015.

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