

## ***Interactive comment on “Pollen-based temperature and precipitation changes in the Ohrid Basin (western Balkans) between 160 and 70 ka” by Gaia Sinopoli et al.***

**Gaia Sinopoli et al.**

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After a debate among authors, we decide to reply more in detail to the referees clarifying how we intend to improve the manuscript. We would ask the editor and the referees to consider this version.

This is a very interesting paper worthy to be published and here are my suggestions for some improvements following the continuity of the text. Referee: P1, Line 25 (and p.14 lines 13-17). For me, the discussion on the stability of the Eemien rests on a misdefinition. Since Jessen, everybody know that an interglacial cycle includes a period of warming after the previous glacial, an optimum and finally a progressive cooling

C1

leading to the next glacial. In this way the instability you mention is a truism! You could just mention that “The Eemian in the Balkans was characterized by an abrupt early warming during its anathermic phase followed a central phase . . .). Most of the authors, when dealing with “instability” or “stability” try to identify some short terms climate “oscillations” disturbing the classical interglacial trend on a warming followed by a cooling (as well discussed latter in your paper).

Authors: THE REFEREE IS RIGHT SAYING THAT THE “INSTABILITY” OF THE EEMIAN IS A WELL ASSESSED SUBJECT. WE WILL TRY TO MAKE CLEARER AND CORRECT IT.

P2, l.30-35. Before Field et al. (1994), at least Beaulieu & Reille (1984,1889) already mentioned a period of transitional warming during the late Eemian.

WE WILL CONSIDER THIS

P3, l.2 and fig. 6: be careful with the coordinates. Les Echets: 45°52'36"N, 4°55'44"E and Lac du Bouchet: 44°54'31"N , 3°47'30" Lac du Bouchet is really transitional between North and South according to your classification. As a matter of fact, this limit at 45°N is of interest as far as the Eemian is concerned, but during the Early Würm the story is more complex with the opposition between the “Odderade style” vegetation and climate successions and the “Grande Pile style” successions. It could be mentioned.

THANK YOU, WE WILL CONSIDER THIS

P3, l.27. : I should prefer “higher resolution”, as an interval of 400 is not high resolution in terms of vegetation dynamics. Would you accept a pollen diagram covering the whole Holocene in only 28 spectra?

WE AGREE, IT'S “HIGHER RESOLUTION”

P4, the first sentence is not necessary as the following description is sufficient.

OK

C2

P4, l.11: do not repeat "karst aquifers".

OK

P5, top: my copy is polluted by three lines in pseudo-latin.

OK, WE WILL DELETE THE ODD PHRASE

P5, l.34: could you develop and explain in more details your choice of 6 modern analogues?

TEXT WILL BE CHANGED "THE NUMBER OF ANALOGUES USED MAY AFFECT THE QUALITY OF THE RECONSTRUCTIONS. IN THE PRESENT PAPER, THE MOST ROBUST RECONSTRUCTIONS ARE OBTAINED USING SIX ANALOGUES. IT'S THE OPTIMAL NUMBER OF ANALOGUES (DETERMINED USING THE LOWEST ROOT-MEAN-SQUARE ERROR OF PREDICTION) TO MINIMIZE THE CHANCES OF FALSELY DETERMINING TWO MODERN SAMPLES TO BE ANALOGUES OR CONSIDERING TWO ANALOGOUS SAMPLES NOT TO BE ANALOGUES"

P6, l. 20:l suggest "pollen records " instead of "data" P6, l.35: again one line polluted with latin.

WE PROPOSE TO CHANGE INTO LOW-RESOLUTION DATA, THE POLLEN RECORD IS THE SAME

P9, l.5 and after: this interesting discussion could be included in the chapter "Materials and methods"?

WE DON'T AGREE: THIS SECTION TRY TO EXPLAIN THE DIFFERENCES IN THE RESULTS DUE TO THE DIFFERENT METHODS USED; SO IT'S REALLY BETTER TO KEEP IT IN THE DISCUSSION PART

P9, l.22: may-be a clumsy statement. If your climate reconstructions are derived from pollen spectra, it would be a great disaster for your results if they were not in agreement

C3

OK, L.26 - WE WILL DELETE POLLEN

P10, l. 24-29: Very interesting but I do not understand how the discussion is inferred from fig. 4: TIC and TOC do not change (slight increase in TOC) during the interval between 137 and 135 Ka marked by high amplitude changes in PAN and TAN??

WE ARE USING DATA FROM OTHER CORES AND OTHER PAPERS. GENERALLY, LAKE-LEVEL CHANGE RESPONDS TO PRECIPITATION CHANGE RATHER THAN TEMPERATURE AND MAY THEREFORE HAVE AFFECTED THE DISTRIBUTION OF LOW-LYING TERRESTRIAL HABITATS ON FLAT TERRACE SURFACES BEFORE THE TEMPERATURE THRESHOLD WAS CROSSED THAT LED TO INCREASING IN-LAKE TIC PRECIPITATION. TOC FROM COMBINED AQUATIC AND TERRESTRIAL SOURCES IS A MINOR FRACTION OF THE TOTAL SEDIMENT AND, AS SUCH, IS SUSCEPTIBLE TO DILUTION BY LITHOGENIC MATERIAL. THUS, IF PRECIPITATION INCREASED THE SUPPLY OF BOTH TERRESTRIAL OC AND LITHOGENIC (SILICICLASTIC) MATERIAL WOULD HAVE INCREASED. DEPENDING ON THE MAIN OC SOURCES THIS CAN LEAD TO BOTH AN INCREASE OR DECREASE IN TOC WITH INCREASING EROSION RATES, OR TOC MAY IN FACT REMAIN TEMPORARILY CONSTANT IF ITS MAIN SOURCE IS, E.G., SOIL OC (INCREASE OF OC AND SILICICLASTIC MATERIAL AT SAME RATE). THUS, WE DON'T NECESSARILY EXPECT TO SEE A COVARIATION OF PANN AND TANN WITH TIC AND TOC AT THIS TRANSITIONAL STAGE. WE WILL TRY TO MAKE IT MORE CLEAR

P10, l 34 : Not that slight??

SEE COMMENTS OF REFEREE 2, QUITE THE OPPOSITE

Chapter 5.4. : it would be of interest to take into account the climate reconstructions based on diatoms populations established by Rioual et al. (2007) at Ribains (see also Shemesh et al., 2001)

C4

THANKS FOR THE SUGGESTION. HOWEVER IT'S NOT POSSIBLE TO ADD IT IN THE FIGURES (E.G. FIG. 5) BECAUSE IN THE RIOUAL ET AL (2007) PAPER, THE TEMPERATURE RECONSTRUCTION BASED ON THE DIATOMS IS NOT DIRECTLY COMPARABLE TO THE OHRID ONES. RIOUAL ET AL (2007) PLOTTED PDCA SAMPLE SCORES POLLEN DIATOMS AS A PROXY OF TEMPERATURE, NOT TEMPERATURE VALUES. IN THE PAPER OF RIOUAL ET AL (2001), THE CLIMATE RECONSTRUCTION BASED ON RIBAINS POLLEN DATA CANNOT BE ADDED HERE IN OUR FIGURE AS ITS PLOTTED AS FUNCTION OF DEPTH, NOT OF AGE. BUT, OF COURSE, THESE TWO PAPERS ARE CITED AND USED IT IN OUR INTERPRETATION

References Beaulieu J.-L. de & Reille M., 1984. A long upper Pleistocene pollen record from Les Echets near Lyon, France, *Boreas*, 13, p.111-132. Beaulieu J.-L. de & Reille M., 1989. The transition from temperate phases to stadials in the long Upper Pleistocene sequence from les Echets (France). *Palaeogeography, Palaeoclimatology, Palaeoecology*, 72, 147-159. Rioual P., Andrieu-Ponel V., Beaulieu J.-L. de, Reille M., Svobodova H. & Battarbee R. W., 2007. Diatom responses to limnological and climatic changes at Ribains maar (French Massif Central) during the Eemian and Early Würm. *Quaternary Science Reviews*, 26 (11-12), 1557-1609. Shemesh A., Rietti-Shati M., Rioual P., Battarbee R., Beaulieu J.-L. de, Reille M. and Svobodova H., 2001. An Oxygen isotope record of lacustrine opal from a european Maar indicates climatic stability during the last interglacial. *Geophysical Research Letters*, 28 (12), 2305-2308.

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