

# ***Interactive comment on “Aligning MIS5 proxy records from Lake Ohrid (FYROM) with independently dated Mediterranean archives: implications for core chronology” by G. Zanchetta et al.***

## **Anonymous Referee #1**

Received and published: 7 December 2015

Review of “Aligning MIS5 proxy records from Lake Ohrid (FYROM) with independently dated Mediterranean archives: implications for core chronology” by Zanchetta et al. (for BGD) General comments

Setting up a sound chronology is essential for discussing the relative timing of paleoenvironmental changes in the terrestrial and marine realms – especially considering the dramatic changes occurring during glacial terminations. Therefore, the paper of Zanchetta et al. is a timely contribution for improving the fine-tuning of the MIS 5 stratigraphy from Lake Ochrid. Setting up a reliable chronostratigraphy for Termination

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II and MIS 5 has furthermore implications for adjusting the time-frame of the earlier glacials/interglacial cycles and glacial terminations.

In general, the authors present good arguments for revising the timing of Termination II. The shape of the  $\delta^{18}\text{O}$  signal as well as its amplitude (approx. 4‰ decrease during T II) match these of the other presented archives (marine records, speleothemes and lake records) quite well – also with respect to the location of the P-11 tephra. However, there are some issues that should be considered before publication, especially concerning the later stages of MIS 5. My major points of concern are listed below:

1) I would like to see the TIC- $\delta^{18}\text{O}$  record being extended in order to fully cover the proposed duration of T II. This might be even more important because the TIC- $\delta^{18}\text{O}$  record is essentially the foundation of the revised tuning! These are only a few measurements but would certainly strengthen the case of the authors.

2) The tuning of the younger part of MIS 5 is not convincing. On first sight it seems plausible to tune the marked  $\delta^{18}\text{O}$  increase between the POP2 and POP4/X6 tephra with the respective  $\delta^{18}\text{O}$  increase in the Popoli section and Corchia Cave. However, the location of the tephra within the isotope record of the Popoli section is different from that of the tephra within the DEEP Site (presuming these are the same tephra). It is therefore doubtful if the tuning point (green dot) between both tephra is robust.

3) I wonder why there is no comparison of the DEEP data to established pollen records from the Mediterranean realm: For the classical Tenaghi Philippon (T.P.) site, high-resolution pollen records are available for MIS 5 (e.g. Milner et al., 2012; Milner et al., 2013; Pross et al., 2015). This record has been tuned to the speleotheme-dated MIS 5 pollen record of Iberian Margin core MD95-2042 (original data by Sánchez-Goñi et al., 1999). Hence, a similar timing as the Lake Ochrid record should be expected for Termination II and MIS 5. Interestingly, comparison of the Iberian Margin pollen record to the planktonic foraminifera  $\delta^{18}\text{O}$  data from the same core show a lag of approx. 4 kyrs by the terrestrial biomes to temperature change, similar to the lake

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Ochrid data set – another argument for the revised stratigraphy. A similar shortcoming is that no attempt was made to compare the Lake Ochrid record to the Monticchio sequence of the last Interglacial (Brauer et al., 2007) which is independently dated based on varve counting and tephrochronology. While tuning pollen records naturally includes the assumption of synchronous paleoenvironmental changes, a comparison of the DEEP data to these archives should be included for a thorough discussion of the stratigraphy.

4) A comparison to summer insolation at 42°N might be helpful as well – note that the TIC peak at MIS 5e coincides with maximum summer insolation in the revised stratigraphy. While this makes sense in terms of climate forcing, this relation breaks down for late MIS 5 in the new stratigraphy. Here the original stratigraphy with the pronounced TIC peak at ca. 82 ka fits better to summer insolation than in the revised version (c.f. figure attached). This offset is odd and should be discussed, if the revised stratigraphy remains as is.

4) No sedimentation rates are discussed, I would also suggest to show them in Fig. 4. How do the sedimentation rates compare between the old and new chronologies?

#### Specific comments

p. 16981, lines 23-24: “the marine isotope signal. . . infers. . .” this wording is odd because the isotope signal itself cannot infer something. Rephrase to e.g. “The marine isotope signal has been used to infer. . .” p. 16982, l. 6: “Woolbreak” – I guess this should read “Waelbroeck”? p. 16982, l. 9-10. “could indicate different processes” is quite a vague statement. Marine and terrestrial proxies naturally report different processes. Please specify what is meant here. p. 16982, l. 25-27: a reference to (Hodell et al., 2013) might be useful. This citation refers to the speleotheme-based tuning of Iberian Margin Sites MD01-2443/2444 via the synthetic Greenland ice core by (Barker et al., 2011). As suggested earlier, the comparison to the pollen records from the Iberian Margin might be of use for this study as well. p. 16991, l. 14: there are no 95%

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confidence limits given in Fig. 4 p. 16992, l. 18: it should read “that the Francke...” (add “the”)

Table 1: What do the number in brackets denote in the column with the new age control points? If this is the 95% confidence interval, please note if this is 1 or 2 sigma.

Fig. 1: Why is Lago Grande di Monticchio shown if no data is presented from this location (although I encourage inclusion of the Monticchio data)?

Figs. 2 + 3: Both figures are too small, the text is hardly readable in print-out.

Fig. 3: the y axis for the Corchia Cave does only reach to -3 ‰ it does not cover the full range of values.

Fig. 3 Caption: Add a “:” after “From the bottom”. Please write all species names in italics. Pre-last sentence: correct “Ohrid” to “Ochrid”

Fig. 4: It might be useful to plot the other target records used for tuning here as well in order to judge how well the new stratigraphy fits to the other records (especially the Popoli section, Corchia, possibly Tenaghi Philippon, Monticchio)

References: Barker, S., Knorr, G., Edwards, R.L., Parrenin, F., Putnam, A.E., Skinner, L.C., Wolff, E. and Ziegler, M., 2011. 800,000 Years of Abrupt Climate Variability. *Science*, 334(6054): 347-351.

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Interactive comment on *Biogeosciences Discuss.*, 12, 16979, 2015.

**BGD**

12, C8312–C8317, 2015

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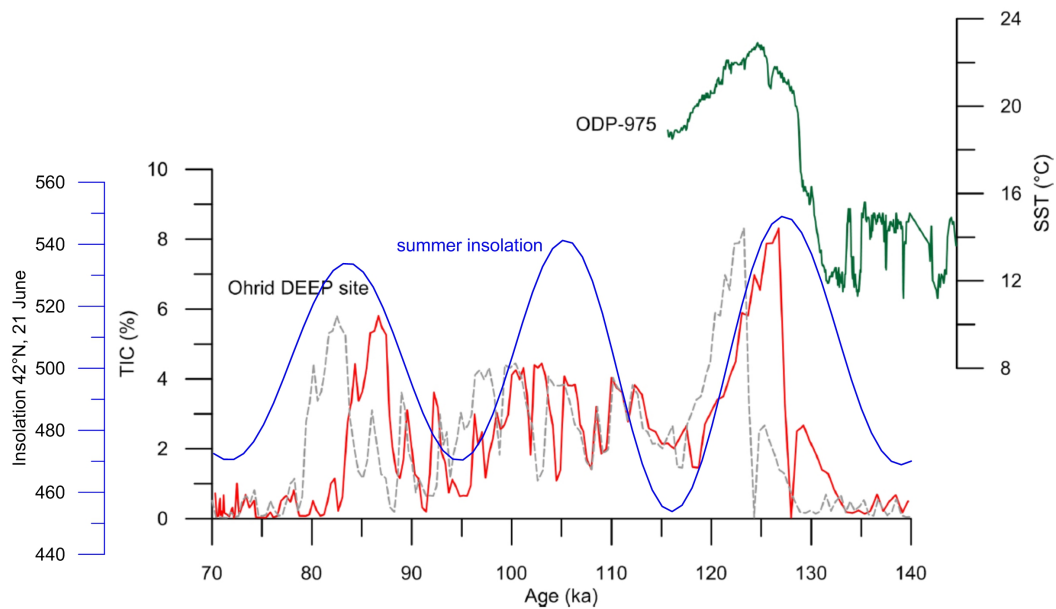


Fig. 1.

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