

Interactive comment on “Ostracods as ecological and isotopic indicators of lake water salinity changes: The Lake Van example” by Jeremy McCormack et al.

Anonymous Referee #1

Received and published: 15 January 2019

article [T1]fontenc

[left= 3cm, right=2cm, top=3cm, bottom=5cm]geometry color

xcolor textgreek indentfirst siunitx graphicx [export]adjustbox cleveref caption la-
belsep=none,textformat=empty nth

natbib

C1

Comments on “Ostracods as ecological and isotopic indicators of lake water salinity changes: The Lake Van example” by McCormack et al.

January, 2019

1 Summary and General Comments

McCormack et al. present a very interesting data-set from a sediment profile (namely, Ahlat Ridge-AR) drilled in Lake Van. There already exist many published papers from the same sediment profile. Other than the previous publications, this manuscript presents abundance data of ostracod species, their temporal morphological distributions, stable isotope data from their valves and C-13 data of bulk carbonate. Accordingly, they offer that abundance of different ostracod species and changes in the morphology of limnocytherinae species reflect the changes in salinity and/or alkalinity of the lake. This suggestion mainly depends on salinity (Tomonaga et al., 2017) and Archaeol and Caldarchaeol Ecometric (ACE) index (Randlett et al., 2017) from previous studies they also support these results with stable isotope data.

My impression about the manuscript is positive. Organization of the manuscript is tidy and easy to follow. I think, the data presented in the manuscript and the efforts in

C2

interpretation are invaluable and I thank and congratulate the authors for their effort. I think the McCormack et al. ignore some of the previously published studies which should be cited and discussed according to their results. Furthermore, if possible, they should present and/or discuss morphological features of contemporary recent species as done for the fossil data. Overall, I think the manuscript should definitely be published in BG journal.

On the other hand, I have major to moderate critics which you can find below.

2 Major/Moderate Critics

1. There is one major debate about the lake level and accordingly precipitation regime of Lake Van region, which recently Ön and Özeren (2018) made us remember. There are different lake terraces which have been dated to between 26 and 20 kyr BP (Landmann et al., 1996; Kuzucuoglu et al., 2010). These terraces have been interpreted as high stand lake level during 30-20 kyr BP and some authors claimed that the region was not arid (Kuzucuoglu et al., 2010; Ön and Özeren, 2018) as claimed by many Paleovan studies (for example, Kwiecien et al., 2014; Stockhecke et al., 2016). It is clear that McCormack et al. do not focus on LGM, however they ignore this debate and present the paleoenvironmental conditions one sided. Furthermore, faunal distribution data and their interpretations presented in this manuscript seem to me, the authors can take part in this discussion, which can be a major contribution to the precipitation regime of the region during LGM (c.f. Tzedakis, 2007).

According to the data presented, can the authors discuss why there is almost no noded species between 30 and 20 kyr BP? Why did maximum number of noded individuals and the number of nodes per valve were attained during MIS 4 and 3 (Page 8, line 7), but nor during MIS 2? At page 4, line 2 they cite

C3

Lake Xinius and Lake Urmia. That is right, Xinius seem to have low level during MIS 2, but previous conditions do not reflect the same conditions of Lake Van. Furthermore, in and around Anatolia there are other high lake levels or evidences of high precipitation rates (see Ön and Özeren, 2018, and references therein). I don't find it fair to cite Urmia and Xinius, while there is a lake level reconstruction presented in Çağatay et al. (2014) and a precipitation reconstruction presented in Ön and Özeren (2018). What if the authors correlate their data with these reconstructions? I can understand, they use curves of Tomonaga et al. (2017) and Randlett et al. (2017), because they are proxies of salinity. However, ACE index has very low resolution and salinity curve reflects fluctuations "over tens of thousands of years" (Tomonaga et al., 2017).

Can the authors elaborate, why they couldn't find no ostracod species between 133 and 125 kyr? Also, if this is due to environmental conditions, they should express the ages according to Stockhecke et al. (2016) (see below comment #5)

2. Why don't the authors inform us with the modern ostracod assemblage, and also, if possible, with the distribution of number of the nodes of modern *Limnocythere inopinata*? They still exist within the lake (Altınışli and Griffiths, 2002).
3. The AR record is mentioned neither in the abstract nor in the introduction. Readers are unaware of which sediment record is being analyzed till section 3. Please name the sediment record, at least, in the introduction with proper references.
4. I know there are too many figures in the manuscript, however readers would want to see the geographical location with a map. This is an optional request since I don't know the restrictions on figure numbers of the journal. Maybe map or some other figures can be presented as supplementary.
5. The chronology is only mentioned as:

C4

Composite profile depth (**and age; Stockhecke et al., 2014b**) was assigned to off-section samples by visual correlation based on high resolution core images.

in page 4, line 24. As far as I know, there are two different age models of AR (Stockhecke et al., 2014, 2016). And these models differ a couple of thousand years during MIS-5 and 6. I know, it won't change the results substantially, however, why do authors use the old age model? Do all the data given to correlate (such as ACE index, Ca/K, salinity curve) use the same old age model? And maybe, the age model should be a little bit highlighted within the text.

6. In the material and methods section: What is the sampling interval? How much dry weight has been used per sample for counting ostracod valves and are these samples normalized to equal weights? I strongly suggest the authors to publish the data. Let the efforts given to this study open new doors to other researchers.
7. Why didn't the authors use the "continuous" *Limnocythere inopinata* species for isotope measurements, please explicitly state that.

3 Minor suggestions

Below you can find my suggestions. I am not a native English speaker therefore language suggestions do not have to be correct.

- Page 1, line 10. Replace "while" with "and"
- Page 1, line 22. Is the "The" at the start of the line necessary?
- Page 2, lines 23-28. Why did the authors describe trace elements of valves with extensive references, is it really necessary? Maybe I am missing something.

C5

- Page 3, line 4. "well-constrained palaeoenvironmental conditions", please expand this or rewrite the sentence.
- Page 3, line 17. No need to cite Litt and Anselmetti (2014) or any other study for this basic piece of information.
- Page 3, line 19. Not "lakes", I think it should be "lake's"
- Page 3, line 23. Delete alkaline.
- Page 4, line 27. Is the resolution 540 years? Otherwise, check the given numbers.
- Page 5, line 2. Maybe it is a good idea to name the dominant species in this sentence.
- Page 5, line 19. What is Van12-08? Any references and/or location? Why did you specifically use it? Frankly, I don't understand the depths given in this sentence.
- Page 6, line 2. Delete "from"
- Page 6 line 6-7. "The highest number of noded valves appears between ca. 73-35, 30-12 and 11-3ka BP with mean percentages of noded valves of 64, 43 and 57% respectively (Fig. 3)." Is this true for 30-12 ka BP. I see many zeros in this interval, or do the authors neglect zeros?
- Page 6, line 10. A comma after Holocene maybe, or rewrite the sentence.
- Page 7, line 23. "At the same time, Lake Van's lake level was at its lowest and the salinity concentrations at its highest (ca. 50 to 80 g kg⁻¹; Tomonaga et al., 2017)". While Tomonaga et al. (2017) express temporal resolution of the fluctuations is over tens of thousands of years, is it true to use salinity to support ideas this way?

C6

- Page 9, line 4. “ the absolute size and number of nodes is smaller “ it should be “are”.
- Page 9, line 17. Delete “In the literature”.
- Page 11, line 4 delete “also effect” to “affects”, or rewrite the sentence which may be a better idea.

References

- Altınışlı S and Griffiths HI (2002) A review of the occurrence and distribution of the recent non-marine Ostracoda (Crustacea) of Turkey. *Zoology in the Middle East* 27(1): 61–76. DOI:10.1080/09397140.2002.10637941.
- Çağatay MN, Öğretmen N, Damcı E, Stockhecke M, Sancar Ü, Eriş KK and Özeren S (2014) Lake level and climate records of the last 90 ka from the Northern Basin of Lake Van, eastern Turkey. *Quaternary Science Reviews* 104: 97 – 116. DOI:10.1016/j.quascirev.2014.09.027.
- Kuzucuoglu C, Christol A, Mouralis D, Doğan AF, Akköprü E, Fort M, Brunstein D, Zorer H, Fontugne M, Karabıyıkoglu M, Scaillet S, Reyss JL and Guillou H (2010) Formation of the Upper Pleistocene terraces of Lake Van (Turkey). *Journal of Quaternary Science* 25(7): 1124–1137. DOI:10.1002/jqs.1431.
- Kwiecien O, Stockhecke M, Pickarski N, Heumann G, Litt T, Sturm M, Anselmetti F, Kipfer R and Haug GH (2014) Dynamics of the last four glacial terminations recorded in Lake Van, Turkey. *Quaternary Science Reviews* 104: 42 – 52. DOI:10.1016/j.quascirev.2014.07.001.
- Landmann G, Reimer A and Kempe S (1996) Climatically induced lake level changes at Lake Van, Turkey, during the Pleistocene/Holocene Transition. *Global Biogeochemical Cycles* 10(4): 797–808. DOI:10.1029/96GB02347.
- Litt T and Anselmetti FS (2014) Lake Van deep drilling project PALEOVAN. *Quaternary Science Reviews* 104: 1 – 7. DOI:10.1016/j.quascirev.2014.09.026.
- Ön ZB and Özeren MS (2018) Temperature and precipitation variability in eastern Anatolia: Results from independent component analysis of Lake Van sediment data spanning the last 250 kyr BP. *Quaternary International* DOI:10.1016/j.quaint.2018.11.037.

C7

- Randlett ME, Bechtel A, van der Meer MTJ, Peterse F, Litt T, Pickarski N, Kwiecien O, Stockhecke M, Wehrli B and Schubert CJ (2017) Biomarkers in Lake Van sediments reveal dry conditions in eastern Anatolia during 110,000–10,000 years B.P. *Geochemistry, Geophysics, Geosystems* 18(2): 571–583. DOI:10.1002/2016GC006621.
- Stockhecke M, Kwiecien O, Vigliotti L, Anselmetti FS, Beer J, Çağatay MN, Channell JET, Kipfer R, Lachner J, Litt T, Pickarski N and Sturm M (2014) Chronostratigraphy of the 600,000 year old continental record of Lake Van (Turkey). *Quaternary Science Reviews* 104: 8 – 17. DOI:10.1016/j.quascirev.2014.04.008.
- Stockhecke M, Timmermann A, Kipfer R, Haug GH, Kwiecien O, Friedrich T, Menviel L, Litt T, Pickarski N and Anselmetti FS (2016) Millennial to orbital-scale variations of drought intensity in the Eastern Mediterranean. *Quaternary Science Reviews* 133: 77 – 95. DOI:10.1016/j.quascirev.2015.12.016.
- Tomonaga Y, Brennwald MS, Livingstone DM, Kwiecien O, Randlett ME, Stockhecke M, Unwin K, Anselmetti FS, Beer J, Haug GH, Schubert CJ, Sturm M and Kipfer R (2017) Porewater salinity reveals past lake-level changes in Lake Van, the Earth’s largest soda lake. *Scientific Reports* 7(1): 313. DOI:10.1038/s41598-017-00371-w.
- Tzedakis P (2007) Seven ambiguities in the Mediterranean palaeoenvironmental narrative. *Quaternary Science Reviews* 26(17): 2042 – 2066. DOI:10.1016/j.quascirev.2007.03.014.

C8