Clim. Past Discuss.,
https://doi.org/10.5194/cp-2018-66-AC1, 2018

Climate of the Past Discussions

Interactive comment on "The 4.2 ka event: multi-proxy records from a closed lake in the northern margin of the East Asian summer monsoon" *by* Jule Xiao et al.

Jule Xiao et al.

jlxiao@mail.iggcas.ac.cn

Received and published: 24 August 2018

Response to the Referees of cp-2018-66

We first wish to express our gratitude to Prof. Raymond Bradley for the review of our manuscript. We think that most of the comments are helpful to improve the original manuscript. We respond to all the comments as follows.

Comments The paper reports on the analysis of a sediment core from Hulun Lake in NE China, focusing on the interval from ∼3000–5000 years B.P. The authors examine grain size, pollen, ostracods and conclude that there was a dry episode centered on

Printer-friendly version

Discussion paper

4230–3820 calendar years B.P., which they ascribe to a weaker summer monsoon. The paper begins with a 1–2 page preamble, which is very similar to the introduction to Xiao et al., 2018 in Quaternary International. I suggest that this section be significantly reduced–the paper could really begin somewhere around line 106.

Response Yes. We agree. The relevant paragraphs before the original line 106 have been re-organized and reduced in length by 23 lines. We think that it is necessary to give a brief review of the history of researches on abrupt climate changes during the Holocene. This review would help the readers understand the spatio-temporal complexity of the Holocene climate variability on millennial to centennial scales so as to contribute to the deepening and extending of the related studies in the future. See lines 62–83.

Comments The manuscript is in fact, a summation of research reported elsewhere, as studies of the ostracods, pollen and grain size have already been reported (Zhai et al., 2011, Wen et al., 2010 and Xiao et al., 2009, respectively) though here they focus on the mid to late Holocene section. I suggest that the Results section be shortened by eliminating the headers to sub-sections 4.1 to 4.4, & simply combining the results into one shorter paragraph.

Response Yes. We totally agree. We have done as you suggested. See lines 231–247.

Comments I offer some additional edits on the file I uploaded.

Response We would like to express our special thanks to you for the careful editing of the manuscript for precise English. We have revised the original manuscript following almost all points noted in the editing. See the revised text.

Comments By the way, it's too bad that you cut up the core in the field–it would have been better to have had a complete core to study using non-destructive methods first (e.g. scanning XRF) to obtain a much higher resolution record than your individual samples provided.

Response No. We don't think so. Scanning of the original core really can generate a mm-scale resolution record, but the output data of both the element and mineral contents are actually ambiguous because the datum is a mixture of signals derived from both terrestrial and lacustrine materials in the case of faulted basin lakes like Hulun Lake that have a large drainage area. Therefore the scanning data of sediment cores can hardly be used to interpret the processes occurring within such lakes, although these data provide a useful tool for connecting core sections recovered from different sites of a lake. In the case of maar lakes that have a quite small catchment, nevertheless, scanning of sediment cores may yield a valuable record of changes in the lacustrine environment and the regional climate.

Comments Some specific issues: Add "B.P." after 4.2 ka in Title and elsewhere in the paper.

Response Yes. We did. See the Title and the related places in the text.

Comments Forget about the Bond cycle connection–it is non-existent (Figure 5) & has no logical place in your argument. The connection to the Stott et al. SST reconstruction is also weak, given the uncertainties in their reconstruction. You should be careful not to over-interpret that record; it is interesting but hardly definitive. I don't think Figure 5 is very useful at all.

Response No. We don't think so. This study is focused on the regional manifestation of the 4.2 ka BP event and the associated mechanism. Therefore possible causes of the decline of the East Asian summer monsoon must be discussed when the 4.2 ka BP event occurring in the monsoon region was identified as a decrease in the monsoon-related rainfall and thus a decrease in the summer monsoon intensity. As discussed in the manuscript, in this regard, it is a logical and widely accepted way to compare the record of the summer monsoon with climatic processes occurring in the low-latitude western Pacific and in Northern Hemisphere high latitudes. It is worth mentioning that the East Asian summer monsoon is completely different from the Indian summer

Printer-friendly version

Discussion paper

monsoon or the African summer monsoon because it can penetrate northward to the areas beyond 45 degrees north. Just for this reason, the East Asian summer monsoon is more largely influenced by climatic processes occurring in Northern Hemisphere high latitudes. Regarding the Bond cycle and the Stott et al. SST reconstruction, we don't deny uncertainties in the interpretation of both records. But we think that both records could be accepted before more precise proxy records are generated for the two key regions.

Comments The reconstructed precipitation during the "4.2 ka event" (based on pollen) is only 10% less than modern values (∼260 v 285mm) so saying this represents "a large decline of the EASM" (line 367) seems unjustified. I think the most significant aspect is the persistence of the reduced rainfall period, rather than the absolute amount.

Response We agree that the word "large" here might not be properly used, although "a large decline of the EASM" is represented not by the reconstructed precipitation alone but by the PCA F1 in which the 4 proxies were synthesized. We have deleted "large" from "a/the large decline of the EASM" in the manuscript. See lines 41, 325, 340 and 360.

Comments Did temperature play a role in driving P–E to extreme values? You don't discuss that, or the overall water balance very much.

Response As you know, it is extremely difficult to distinguish the role of temperature from precipitation in driving the water balance of lakes using the proxies of the lake sediments. Given that the 4.2 ka BP event is characterized by a cold event in many regions of the Northern Hemisphere, however, the evaporation in the study region should not be increased around 4.2 ka BP. In other words, the drought occurring in the study region around 4.2 ka BP could be closely related to a decrease in the regional precipitation at that time.

Comments Could there have been an increase in eolian sediment input that contributed to a rise in the sand fraction?

Response No. Eolian deposits like the Chinese Loess are dominated, in grain size, by the silt fraction. So an increase in the eolian input cannot result in a rise in the sand fraction.

Comments Overall, this is a useful contribution to a Special Issue on the 4.2 ka B.P. event, as it demonstrates that there was a detectable climatic anomaly even at the northern limit of the East Asian summer monsoon.

Response Thank you for the favorable comment on our manuscript! We believe that we provided a valuable record of the 4.2 ka BP event for a key region on the globe.

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2018-66/cp-2018-66-AC1-supplement.pdf

---

Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2018-66, 2018.

Printer-friendly version

Discussion paper