

Dear editor and reviewers,

Many thanks for your kind letter and for reviewers' constructive comments concerning our manuscript entitled "Wet/dry status change in global closed basins between the mid-Holocene and the Last Glacial Maximum and its implication for future projection" (Manuscript No.: cp-2020-21). According to the reviewers' comments, we have revised our manuscript to improve the statement and discussion and to meet with the requirements of the journal. In this revised version, changes to our manuscript within the document were all highlighted by using red colored text. Point-by-point responses are listed below.

Yours sincerely,

Xinzhong Zhang

Corresponding author:

Name: Yu Li

Address: College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000, China

E-mail: liyu@lzu.edu.cn

General response: We very much appreciate the careful reading of our manuscript and valuable suggestions of the reviewer. Referee suggested the mechanisms of change need developed through a more thorough review of the literature. Accordingly, we have corrected the inappropriate statements and extensively revised the discussion. A new Figure 4 was added in the discussion section and other changes were marked by red colored text in the revised version. The point-by-point responses are listed below.

Zhang et al., have presented a substantially improved manuscript. I appreciate their efforts to dive in and clarify the writing and presentation. Overall I think the manuscript is an important contribution. My main concern is that the mechanisms of change need development and support. The authors present compelling patterns of change (LGM to Mid Holocene and Preindustrial vs 21st century). But the mechanisms of change need work. The authors state in the abstract: "The long-term pattern of moisture change is highly related to the high-latitude ice sheets and low-latitude solar radiation, which leads to the poleward moving of westerlies and strengthening of monsoons during the interglacial period." I agree with this statement, but these concepts are poorly developed in the manuscript. As presented, there are some poorly referenced conceptual ideas in the discussion, but a limited amount of text to support the above statement. At minimum the mechanisms of change need developed through a more thorough review of the literature. Bhattacharya et al. (2018); Routson et al. (2019); and Ramisch et al., (2016) would be some good papers to start with. Ideally the authors would present some evidence that their proposed mechanisms were indeed the cause of the observed changes, rather than simply associations.

A few line by line comments follow:

1. Line 11: Delete 'the' in this sentence: "By integrating lake records, ...

Thanks for your suggestion. We have revised it and checked other parts.

2. Lines 16 and 17: Please define abbreviations before use (ENSO AI-MEI).

Thanks for your suggestion. To avoid redundancy in the Abstract, we have clarified the sentence as follows "However, modern moisture changes show correlations with El Niño/Southern Oscillation in most closed basins, such as the opposite significant correlations between North America and Southern Africa and between Central Eurasia and Australia, indicating strong connection with ocean oscillation."

3. Line 101: A significance level of 95%...?

We have checked it in other literatures and the original statement is indeed right.

4. Line 127: Please site a reference that suggests hydroclimate records from western China are controversial. Or remove statement.

Thanks for your suggestion. we have removed the statement and revised the sentence as this "Generally, lake level changes match climate changes from the proxy records well except for Central Asia (Fig. 1)."

5. Table 2: Label numbers as months.

Thanks for your suggestion. We have changed it in all tables.

6. Line 164: October is wetter than July. So the wettest months = June-November, or July - October rather than July - September.

Thanks for your suggestion. Here we mean that the average increasing of precipitation during July-September is wettest. To avoid ambiguity, we have revised it accordingly "The precipitation increases about 50% from the LGM to the MH in the wettest months of July-October, 13% from PI to L21 in the wettest months of February-April."

Line 165: This is an odd result that evaporation diminishes in the future when there will be strong warming. Am I reading this correctly?

Thanks for your reminding. Here we refer to the seasonal difference in evaporation and precipitation. We have clarified it as "Seasonal variation in evaporation is smaller than that in precipitation but keep the same pattern. In addition, precipitation and evaporation changes from E21 to L21 make significant contributions to the increasing of precipitation and evaporation from PI to L21, especially in the boreal summer half-year."

Line 205: This sentence is confusing. I think I'm tracking now, but please clarify.

Thanks for your suggestion. We have revised the discussion to improve the readability and clarify this sentence in other part as follows "On a shorter timescale of modern times, strengthening or moving of monsoons and westerlies are largely limited compared to that from the LGM to MH."

References:

Bhattacharya, T., Tierney, J. E., Addison, J. A. and Murray, J. W.: Ice-sheet modulation of deglacial North American monsoon intensification, *Nature Geoscience*, 11(11), 848–852, doi:10.1038/s41561-018-0220-7, 2018.

Ramisch, A., Lockot, G., Haberzettl, T., Hartmann, K., Kuhn, G., Lehmkuhl, F., Schimpf, S., Schulte, P., Stauch, G., Wang, R., Wünnemann, B., Yan, D., Zhang, Y. and Diekmann, B.: A persistent northern boundary of Indian Summer Monsoon precipitation over Central Asia during the Holocene, *Science Reports*, 6.

Routson, C. C., McKay, N. P., Kaufman, D. S., Erb, M. P., Goosse, H., Shuman, B. N., Rodysill, J. R. and Ault, T.: Mid-latitude net precipitation decreased with Arctic warming during the Holocene, *Nature*, 568(7750), 83–87, doi:10.1038/s41586-019-1060-3, 2019.