

Clim. Past Discuss., author comment AC3
<https://doi.org/10.5194/cp-2021-55-AC3>, 2021
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Reply on RC3

Mengna Liao et al.

Author comment on "Different facets of dry–wet patterns in south-western China over the past 27□000 years" by Mengna Liao et al., Clim. Past Discuss.,
<https://doi.org/10.5194/cp-2021-55-AC3>, 2021

Thanks very much for the detailed and constructive comments for our manuscript.

We will find a professional language editing company to improve the language. If the CP has good English editors to recommend, we are also happy to accept.

Here is the replies for the main comments:

1. Have the authors considered how human activity and associated changes in vegetation impact their modern pollen calibration set?

Reply□

This is a sort of tough issue here. The modern vegetation distribution suffering from climate change and human activities. It is always difficult to distinguish between the natural and anthropogenic impacts. In this study, the modern pollen data are samples collected in areas with as little human interference as possible, so as to minimize the influence of human activities. Considering that the modern pollen calibration set covers a large climatic gradient (from humid to arid areas), pollen data can reflect typical vegetation types corresponding to different climatic characteristics. Therefore, the relationship between climate and vegetation here should be robust despite anthropogenic impact did exert.

2. About Fig.5

Reply:

We appreciate for pointing out the problems about Fig. 5, which enable us to redraw the figure to make it more readable. Please check the redrawn Fig.5 in the supplement uploaded below.

3. If reconstructing SWSI from pollen, why not also reconstruct precipitation amount and temperature? Reconstructing temperature and precipitation directly would provide an additional, although not independent, test on the paper's hypothesis. Would pollen based T and P reconstructions show warmer temperatures overcame simultaneous increases in precipitation during periods of low SWSI but high rainfall?

Reply:

We did reconstruct precipitation and temperature based on the same modern pollen calibration set used in this study. Please see the results in the uploaded supplement below. As you can see from the results, the reconstructed precipitation was reasonable. But for temperature, the reconstruction was not completely consistent with other reconstruction results from southwestern China. This is because the modern pollen calibration set we chose primarily reflects the gradient of humidity. The main reason we did not use the precipitation and temperature reconstruction results is, as you had mentioned above, the independence problem between different reconstructions. Even so, we can still find some clues that show warmer temperatures overcame simultaneous increase in precipitation during 8-3 cal. ka BP (marked as yellow shadow in the figure uploaded) of low SWSI but relatively high rainfall.

4. The lake is relatively shallow with a large surface area. Substantial or persistent increases in temperature, or decreases in effective precipitation would likely lower lake level, as seen since 1978. I'm concerned that changes in lake level would impact both the grain size record and the $\delta^{18}O$ record. Lower lake levels would expose large areas of sediment prone to erosion. For example, Brian Shuman and others have developed lake level reconstructions using sand layers that extend into the lake during low stands. In these cases, increases in sand reflect less effective rainfall, not more as interpreted by this study. Lower lake levels would also have a strong impact on the $\delta^{18}O$ concentrations. Do the authors have any indicators of Holocene lake level change at Yilong Lake? Can the authors help control for the possible influence of lake level change on their rainfall indicators? Given the correlation between the Yilong Lake records and speleothem records of Holocene Asian Monsoon, I'm hopeful that changes in lake level have not impacted these records. Nonetheless, controlling for lake level changes would be useful. Perhaps a pollen reconstruction of precipitation amount would corroborate with the $\delta^{18}O$ and grain size records and not be directly impacted by lake level changes? I would be interested to hear if the authors have other ideas.

Reply:

We agree that variations of lake level probably have some influence on grain-size composition for shallow lakes like Yilong Lake. So in the first paragraph of section "4.1 Precipitation change revealed by grain size", we tried to clarify whether precipitation intensity or lake level change should be the main cause for grain-size variations. According to a previous study on grain-size distribution in the surface sediment of Yilong Lake, the median grain size is negatively correlated with water depth and the frequency curves of grain size show a transition from "bimodal" to "unimodal" shapes as the water depth increases (Zhang et al., 2019). In general, increased regional precipitation not only increases the erosion intensity of the basin, but also increases the runoff, both of which will also lead to the transportation of more coarse particles into the lake. In this study, we found that most of the samples with relatively big median grain size show a "unimodal" but not a "bimodal" distribution mode (please check the Fig. S2 in the Supplement uploaded with the MS). Then a reasonable explanation we consider is that the intensified precipitation transported more coarse particles into the central part of the lake but meanwhile the lake level was high, so that grain-size distribution reflected a "unimodal" shape but the median grain size was coarser. Another clue can more or less support this hypothesis is the changes in Fe/Mn ratio (please see Fig. 3 in the MS). The Fe/Mn ratio during 15~9 cal. ka BP was much higher than other periods, indicating that lake level in this period was in a high-stand. The median grain size was relatively big within the same period except for the YD event.

Zhang, L., Zhang, H., Chang, F., Duan, L., Hu, J., Li, T., Cai, M., and Zhang, Y.: Spatial variation characteristics of sediment size and its environmental indication significance in

Lake Yilong, Yunnan Province, Quaternary Sci., 39, 1159–1170,
<http://doi.org/10.11928/j.issn.1001-7410.2019.05.08>, 2019b. (in Chinese, with English abstract)

Thanks again for the comments!

Mengna Liao

Please also note the supplement to this comment:

<https://cp.copernicus.org/preprints/cp-2021-55/cp-2021-55-AC3-supplement.pdf>