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Climate of the Past Discussions

Interactive comment on "Intra-seasonal hydrological processes on the western Tibetan Plateau: Monsoonal and convective rainfall events ~ 7.5 ka ago" *by* Linda Taft et al.

Anonymous Referee #2

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Taft et al present a novel source of information about past monsoon variability - variations in oxygen and carbon isotopes from gastropod shells. Unlike other proxies, which average over decades or centuries, this proxy has the potential to provide subseasonal resolution about the monsoon. My comments fall into two general categories: improving the paper's organization and clarity, and improving the interpretations of climate from isotopes.

General comments on paper organization and clarity:

a) Some sections could be shortened to improve readability. Examples of places to reduce the details and make the main points clearer are: lines 89-117 (focus on summa-

rizing regional patterns rather than providing description of lots of lakes individually), lines 144-193 (focus more on details relevant to this study), lines 468-500 (combine with similar information in section 4.3.2), lines 562-633 (it is unhelpful to provide one entire paragraph for each shell; one paragraph summarizing the main similarities and differences would be preferable).

b) Are Table 4, Section 3.2, and Section 4.2 regarding mollusk ecological traits necessary? They don't seem to contribute to the main goal of the paper.

c) Much of the discussion is more appropriate for a results section. For example, section 4.1 could be added to section 3.1. Lines 562-633 could be moved to section 3.3. The main things that should remain in the discussion are the inferences about climate.

d) The paper would benefit from editing throughout for proper English usage.

Climatic interpretations of isotopes:

a) The d18O and the d13C proxies are very complex with multiple competing influences, as the authors describe on lines 512-560. Thus, there are many different ways to explain a particular isotope excursion. Having both d18O and d13C does not necessarily help, either, because d13C is so complex. For this reason, some of the detailed interpretations presented on lines 562-633 regarding certain excursions being due to soil inwash, for example, or others being due to meltwater pulses, etc., seem very arbitrary and overinterpreted. For one more specific example, the authors generally consider periods of low d18O variation to be ice periods, but on line 571-573 a similar low-variability period is considered "too long" to be due to ice and is assigned another cause (even though it is impossible to say anything definitive about how many weeks or months a particular part of the shell spans). A simpler, more defensible, and more objective approach might be to report on several relevant metrics (like mean, standard deviation, and range) and compare how these vary from modern to Holocene.

b) I wished for more isotopic data from modern shells to compare with the five Holocene shells, in order to more quantitatively describe the modern-Holocene differences. At one point, the authors give the mean of two modern shells and this is useful for a very first order comparison of the hydrology (but one that could also be explained by changes in lake water residence time that we already know about between early/mid Holocene and modern). The stated goals of the paper are to look at more of the sub-seasonal signal, though, and for that we really need to compare with sub-seasonal signals of modern samples. Perhaps the authors have published such data in other papers. In that case, it would be useful to present it here again for comparison.

c) Given the large interannual variability in the monsoon region, it is unclear that 5 years is enough to truly give a good sample of Holocene monsoon climate. This is unfortunate, because I know how much work goes into sub-seasonally sampling even one shell! But it is important to recognize what these results do and don't tell us.

d) I was confused about the conclusion that the precipitation is not continuous, but in pulses. Generally, precipitation does occur in pulses (storms), even in locations within the core monsoon. Particularly in this dry part of the world, it doesn't rain every day, but certain weather systems will deliver moisture from time to time. So, this conclusion seemed obvious and non-consequential. The authors mentioned that lakes on the eastern Tibetan Plateau reveal single extended events (line 640-641), but there are other factors such as significant groundwater inflow that could smooth a d18O series.

e) It was also unclear how the conclusions about the northern boundary of the monsoon were reached. How can you tell this from one lake? You just know that this particular lake received monsoon moisture both today and in the early/mid Holocene. I think it is very hard to say, based on difficult-to-interpret isotope data and only five years worth of data, that this lake received more monsoon rainfall during the Holocene than today. It seems like a transect would be needed to really answer this question.

f) Conclusions distinguishing monsoon precipitation from meltwater influence do not

seem supportable because the isotopic ranges for these sources are not obviously differentiable (according to lines 512-527, estimates for monsoon precipitation and snowmelt are both around -14 per mil).

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