Biogeosciences Discussions

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Comment on bg-2021-127

Anonymous Referee #2

Referee comment on "Isotopic differences in soil–plant–atmosphere continuum composition and control factors of different vegetation zones on the northern slope of the Qilian Mountains" by Yuwei Liu et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-127-RC2, 2021

In this manuscript, Liu et al. explored oxygen and hydrogen isotope signals in precipitation, groundwater, soil water and plant water in different vegetation zones within the upper reach of Shiyang River Basin, and aimed to elucidate internal linkages between various water bodies. Such investigation could deepen our understanding on mechanisms in water cycle and facilitate ecosystem management of water-limited areas. The topic of manuscript falls into the scientific scope of *Biogeosciences*. The authors selected three representative vegetation zones in the study area, and worked hard to collect many samples last for more than one year. I believe their data are informative and interesting. However, in my view, the manuscript is not well written, including the whole structure, data analysis, interpretation of results, discussion, and language issues. Thus, the current version of this manuscript is beyond the standard of BG, and I suggest the authors resubmit the manuscript after major revision.

Major concerns

- It is difficult to figure out the background and necessity of this study from the current version. In the initial paragraph of Introduction, the authors only told us that water isotopes were useful with so many sentences, but they didn't show us the latest developments and trends of isotopic research in soil-plant-atmosphere continuum. In the second paragraph, the authors described soil water, precipitation, and plant water. But they didn't raise any scientific problems. Until the last paragraph, the authors still didn't state the reasons to perform research in Shiyang River Basin.
- In the current version, Introduction, Results, and Discussion sections were mismatched from each other. From Introduction, I understand the authors intend to analyze the isotopic differences in different bodies and the potential controlling factors. However, no

data on the controlling factors were shown in Results, while temperature and altitude were discussed in Discussion, which were not mentioned before. I suggest to reorganize the manuscript and closely link each section.

- A subsection on data analysis is also necessary in the Materials and Methods section. In Results, I found many words like "…smaller than…", "…greater than…", "…the smallest…", and "…closer to…". Such presentations need solid evidence of statistical analysis. So do the comparisons of slopes and intercepts between different water lines. It will also be better to show the quantitative relationships between isotopic information of SPAC and potential controlling factors.
- The manuscript needs to be modified to avoid ambiguity and obscurity of expression. Such as the sentence in L52-54, "Because the isotope ratio in soil moisture obviously changes with depth, when water is transported between plant roots and stems, it reaches the leaves or young unbolted branches before its isotopic composition has not changed". I am confused about what is the intention of such presentation, what is the logic here. There are other sentences like this through the manuscript.

Specific comments

L1: As first mentioned in the title, the abbreviation SPAC should be written as its complete form, soil-plant-atmosphere continuum. Also, the authors may want to say "Isotopic differences of…".

L15: "The results showed…".

L26: "…changes of oxygen and hydrogen isotopes in water…".

L41: "…, but also…".

L43: Nie et al., 2014.

L46: It seems that the "SPAC" appears suddenly here. Necessary conversions of words and content are needed.

L49: Both "soil water" and "soil moisture" are used in the manuscript. I suggest use one of them.

L51: Is sampling of the current study involving desert vegetation?

L56-58: "The source of plant water use can be determined by measuring…".

L66-70: The sentence is too long, and specific subjects before "can" and "lay" lack.

L70: "plant transpiration" or "vegetation transpiration".

L90: What kind of the drought index?

L90: "…classified as…", not "divided into".

L91-93: Replace these descriptions with exact data.

L96-97: Add to the previous sentence.

L98: Did the authors investigate vegetation in the study area? If yes, please show the data of vegetation coverage; if not, relevant references should be added. In addition, "relatively good" is not a proper expression in scientific papers.

L102: "Samples of…were collected…"

L109: "telling the date"?

L111: Are there any replicates for soil samples of each soil layer?

L117: How many plant species are sampled? How about the position of sampled stems in the canopy? What is the size of stem samples? "xylem stem" should be "stem".

L120: How is the groundwater sampled? What is the depth of water table at each

sampling point.

L126: How many isotope standards were used?

L133: “Due to the existence of methanol and ethnol in plant water samples…”

L148: Since different water lines have been defined here, I suggest the revised manuscript used their abbreviations hereafter.

L148-150: These information should be mentioned in the Introduction section.

L152-159: Sentences are repeated here.

L163: Is there any data or references for such statements.

L169-171: These results should be based on proper statical analysis.

L190-192: Any data or references?

L192-194: References are also needed here.

L192-198: Since this is the Results section, I suggest move these content to Discussion.

L197: “The dry foothills…”.

L209, L212: “affluent” and “abundant” are not proper words here.

L216-217: This is not a convincing conclusion.

L244: Why use 8â□□ as turning point?

Fig.1: "Shiyang River syste"? Is it "Shiyang River Basin"? The letters (a, b, and c) should be explained in figure caption.

Fig.2: Please rearrange the graphs in a single column or row.

Fig.3: "θ" should be defined here. I also suggest the graphs on the left and right panel using a same x-axis range, respectively.

Fig.4: Where are the standard deviations or errors?

Fig.6: Please define M1, M2 and M3 in the figure caption. How is the situation of hydrogen isotope?

Table 1: Are the comparisons including significance testing?