Hydrology and Earth System Sciences Discussions

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Reply on RC1

Jinzhao Liu et al.

Author comment on "Controls on leaf water hydrogen and oxygen isotopes: a local investigation across seasons and altitude " by Jinzhao Liu et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-246-AC1, 2022

Comment:

I appreciate the Editor to give me a chance to review the paper.

The manuscript "Controls on leaf water hydrogen and oxygen isotopes: A local investigation across seasons and altitude" presents a dataset on analysis of δ18Oleaf and δ2Hleaf together with isotopes from potential source waters and meteorological parameters along an elevation transect on the Chinese Loess Plateau. The research topic is important and within the scope of the journal.

But it seems a bit simple and not systematic in the content. The manuscript at present lacks novel results or theory that would provide a significant advance in this field.

Response:

Thanks a lot for your comments. Our study have two significant novel points: 1) the previous studies have always emphasized on the combined $\delta^{18}O$ and $\delta^{2}H$values of leaf water ($\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$), few considering the respective responses or variations of $\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$. A recent global meta-analysis indicate that the respective $\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$ reflected differently, seen details in Cernusak et al. (2022; NP). However, our local-study supported that $\delta^{2}H_{leaf}$ responds more closely to xylem water than $\delta^{18}O_{leaf}$, but both $\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$ responds comparatively to climatic factors (RH, T), challenging the global meta-analysis (Cernusak et al., 2022); 2) We proposed a framework that control the leaf water isotope line by using multivariate statistical methods (Hierarchical clustering, Craig-Cordon model, Structural equation model, HYSPLIT, etc)

Reference

Cernusak, L. A., Barbeta, A., Bush, R., Eichstaedt R., Ferrio, J., Flanagan, L., Gessler, A., Martín-Gómez, P., Hirl, R., Kahmen, A., Keitel., C., Lai, C., Munksgaard, N., Nelson, D., Ogée J., Roden, J., Schnyder, H., Voelker, S., Wang L., Stuart-Williams, H., Wingate, L., Yu, W., Zhao, L., Cuntz, M., 2022. Do ^{2}H and ^{18}O in leaf water reflect environmental drivers differently? New Phytologist, DOI: 10.1111/nph.18113.

Comment:

- *The main conclusion of this paper has been confirmed by previous studiesï¼□ the first-order control on δ18O leaf and δ2Hleaf values was the source waterï¼□and the second-order control was the enrichment associated with biochemical and environmental factorsï¼□Cernusak et al., 2016; Barbour et al., 2017; Munksgaard et al., 2017). The experimental design and results of the paper are not innovative.*

Response:

Thanks. "The first-order control on $\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$ values was the source waterï¼□and the second-order control was the enrichment associated with biochemical and environmental factorsï¼□Cernusak et al., 2016; Barbour et al., 2017; Munksgaard et al., 2017)" is deed analyzed by previous studies, as discussed in Introduction section. Our studies analyzed the responses of respective ($\delta^{18}O_{leaf}$ and $\delta^{2}H_{leaf}$) and both to source waters (xylem water, soil water, and precipitation) and to meteorological parameters (temperature, RH). As above stated, we have two significant novel points.

Comment:

2) A large number of studies have shown that the enrichment associated with plant transpiration is an important factor affecting δ18Oleaf and δ2Hleaf values. However, the authors did not carry out research and discussion in this paper.

Response:

Thanks. We have added more discussion on transpiration.

Comment:

3)Plants and soils were sampled in May, July, and September 2020 (In the experimental design). Why only choose this three months? Is it persuasive?

Response:

Thanks. The growing season lasts from late April to Early October on the Chinese Loess Plateau, so we selected the pre- (May), peak (July), and post-(September) growing season. Also, the precipitation $\delta^{18}O$ and $\delta^{2}H$ varies across months (Fig. 5a, b), which was caused by different moisture transport routes from HYSPLIT (Fig, 5c).

Additionally, we sampled at the same plots (ten plots) along an elevation transect from ~600 m to ~3600 m, the three repeated sampling is OK. If more, the sampling will be a burdensome work and the plants is not available for more repeated sampling.

Comment:

4ï¼□Besides, what is the specific sampling interval?

Response:

Thanks. The sampling plots were arranged for ten plots from ~600 m to ~3600 m along an elevation transect, which was detailed in Fig, 1 and supplementary Table S1.

The sampling plots were randomly selected in the first campaign from the bottom to top of mountain, then repeated by the next two sampling campaigns.

Comment:

5) Why only one or two deciduous and coniferous trees were chosen in each plot?

Response:

Thanks. There was a significant vegetation zone along an elevation transect of Mt. Taibai (Fig.1 and M&M), so we selected the dominant species at each zones.

Comment:

6) There are large differences in population and altitude between sampling points 5-8(Fig.1). But there is no weather station here.

Response:

Thanks. The weather stations along an elevation transect was very hard to settle up, the available weather stations were presented in Fig.1. We thank to Shaanxi Meteorological Bureau for supporting meteorological data. It is possible that more weather stations will be settled up along this elevation transects in the future.

Comment:

7) In 4.1ï¼□these results argued with the recent global meta-analysis thatδ18Oleaf and δ2Hleaf values reflect climatic parameters (i.e., RH and temperature) differently. What are the reasons for the controversial conclusion?

Response:

Thanks. It is really a good question, I think it is probably due to the scale difference, e.g.,

global vs. local. The reason needs to be further explored in the future.

Comment:

8) It seems a bit simple in the conclusion. It needs a stronger ending for the conclusion. Besides, it is suggested to supplement the existing deficiencies and prospects.

Response:

Thanks. We have strengthen the conclusion.

Please also note the supplement to this comment:
https://hess.copernicus.org/preprints/hess-2022-246/hess-2022-246-AC1-supplement.pdf