Comment on hess-2022-120

Anonymous Referee #2

Referee comment on "Comparing water uptake patterns of two plantations using stable isotopes in Chinese Loess Plateau" by Yongsheng Cui et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-120-RC2, 2022

Comparing water uptake patterns of two plantations using stable isotopes in Chinese Loess Plateau

Comments to the authors

The topic treated in this manuscript seems to be of great interest for the studied regional area, namely the Loess Plateau of China. As described in detail by the authors, an evaluation of the RWU of different tree species is pivotal to better understand the water consumption related to the presence of artificial tree plantations in this area. In particular, this is pivotal to shed light on the consequences of massive afforestation and how they affect the delicate balance of an ecosystem. Therefore, in my opinion, the study fits the need for scientific data to determine the sustainability of agricultural practices, in terms of guaranteeing the sustainable development of the Loess Plateau and mitigating water scarcity.

The study compares two sites characterized by different tree species, *R. pseudoacacia* and *P. tabulaeformis*. Tree and soil samples were collected periodically within two growing seasons to determine the soil water content and water sample isotope composition. To establish the soil depth at which RWU occurs, the results of the direct inference method were compared to the results of the MixSIAR model. Moreover, meteorological data (precipitations) and the soil water content are combined to estimate the overall evapotranspiration for the site. In my opinion, the study is well described and contextualized, however, improvements are needed to make the text more effective and comprehensible to readers. In particular, the M&M section lacks more precise information about the structure of the sampling, which is unclear in some parts (how many trees were selected per site? Different trees at each sampling? How were they selected? An overall

description of the principal characteristics of the two tree species in each site would also be needed). Obviously, the decision of the sampling size in an extensive sampling campaign has to take into account several factors (time, budget, material, etc.), but considering the large variability that could be found in natural environments, the choice of two samples per site per sampling seems a rather limiting factor to result interpretation. Moreover, I believe the authors should have included additional measurements of the tree physiological conditions (have you measured any difference in the water stored by plants in mild dry and mild humid seasons?) and an in-situ investigation of the tree root system, to further support the results of the model. I invite the authors to consider these points in further studies. For what concerns this manuscript, I would suggest some improvements and revisions to the text before publication. Additionally, I invite the authors to carefully revise the English usage to improve the text clarity, conciseness, and wording.

Hereafter, a list of points that require adjustments before publication.

Line 51: "Soil moisture is the main water source of vegetation growth". Revise the use of the prepositions.

Line 60: "as an active layers" please correct.

Line 65: What do you mean with water transformation? Do you refer to the physical changes of the water molecules?

Line 73-76: the sentence should be revised, as it is not clear.

Line 74: As you refer to a comparison among different species, which species were selected?

Line 79: "These studies mainly focused on plants with yearly leaf abscission and studied the

80 seasonal variations generally". But a study in which *R. pseudoacacia* was studied is just mentioned, and only two other plant species are reported in this section.

Line 91: "It is unclear whether the predicted results obtained by one method is justified" Which method?

Line 93: "from 2019–2020" Revise the use of the prepositions.

Line 96: "3) to provide a scientific basis for the optimization of plantations with the combination of soil water storage (SWS)". Not clear. Please revise.

Line 100: "The *R. pseudoacacia* and *P. tabulaeformis* plantations were widely planted since implementation of the "Grain for Green" project". Additional information related to the two species? Age, height, dimension of the crown, diameter, leaf area?

Line 101-107: Can you provide a reference for the information in this section?

Line 118: Did you use only two trees for the whole sampling campaign, conducted in two consecutive years with periodical tree and soil sampling? Or were two different trees within the same plot at every sampling selected? How were the trees selected? In any case, I believe that the number of trees is rather low for such a study, limiting data interpretation. How do you justify this choice?

Line 119: "which was regarded as the main growth reason and the end of growth reason". Season instead of reason?

Line 122: "ping-pang ball" □ ping-pong ball.

Line 124: "in the middle and upper canopy". Can you specify the middle and upper height of the canopy? Which is the total height of the trees?

Line 126: "and stored twig" □ and twigs were stored

Line 128: "soil was sampled by auger around the sample tree with three replicates". Was the soil collected every time around the same trees? As pointed out in my previous comment, it is not clear if the trees for the sampling were always the same or different at each sampling. At which distance from the tree was the soil collected?

Line 132:" the other part was stored in a 50 ml polyethylene vial" for which purpose? Isotope analysis? Please be more precise.

Line 157: "We assumed that the time delays between sampling and water transport were not significant". Do you mean the difference in the isotope composition of the soil and the tree samples, due to the time delay between root water uptake and water distribution in the twigs? Please revise the sentence.

Line 160: "After compared the raw and representative isotope values," □ after comparing

Line 165: "raw plant xylem water". In line 79 the authors introduce the terms plant and tree, underlying the difference between the two, particularly in relation to studies of the RWU. It is then added that this study is focused on artificially planted trees. To be more consistent throughout the text, I suggest using the same terminology. Please check the text for incongruities.

Line 173-176: Please, specify the meaning of P in formula 4.

Line 193: "more than 882.36". If you provide such a specific value indicating the amount of transpired water, I expect to read "it was 882.36 mm" or "it was more than 880 mm".

Line 205-206: "Both plantations increased SWS from shallow to deep soil layers over time in 2020". Looking at figure 3, it seems that there is a decrease in SWS for *R. pseudoacacia* between 0 and 100 cm. Please verify the data and revise the sentence.

Figure 3: What does the range in the x-axis indicate? It varies in each plot and is not in agreement with the overall amount of SWS reported in each block of the figure. Without an explanation, it's confusing. Please, add more details in the Figure caption.

Figure 4: Is the LMWL the same for the two sites? Were the precipitation samples collected only from one of the two sites? What is the distance between the two sites to assume that there is no difference in the isotope composition of the precipitation? Have you tested this claim?

Line 227: "For total soil water samples". What do you mean by total soil water samples? Is this the average isotope composition for the whole soil core? Can you also provide the summary of the soil water isotope composition for samples collected in 2019?

Line 237-240: Have you calculated the d-excess? It could provide additional information regarding the more enriched isotope composition of the soil water in the upper layers.

Line 242-250: I assume that the results reported in this first section are related to the direct inference method. To ease the reader's comprehension of the text, I suggest specifying it at the beginning of the sentence (as in line 251).

Figure 6: Why is the contribution rate of soil water to *R. pseudoacacia* (R.) and *P. tabulaeformis* (P.), calculated on the MixSIAR model, based on the values of $\delta^{18}O$ only? Have you tested the model also for the δ^2H results?

Line 255-256: "while *P. tabulaeformis* still mainly absorbed water from the 0–40 cm soil layer". But the coefficients reported in Fig. 6 for the different soil layers are very similar. And later on (line 302), you describe the water absorption for R. Pseudoacacia has evenly distributed among the different layers. But coefficients are comparable (209 July R and 2019 August P).

Line 278-280: The meaning of this part is not clear. Can you improve it?

Line 286: "while the $\delta^{18}O$ values in the 0–40 cm soil layer became smaller". I suggest using lower/higher or depleted/enriched.

Line 288-289: According to the isotope data, can you quantify how much precipitation water infiltrated in the soil? Is it comparable to the overall amount of precipitation for the indicated period in the area?

Line 294: Is there any kind of foliar cover on the top of the soil that could limit evaporation or is it bare soil in both the sites?

Line 311: "However, the root length". The use of "however" seems inappropriate here.

Line 337: "increasement" □ Please substitute with increase or increment.

Line 366-368: This part is not clear, please revise.

Line 371: "which would also good for the long-term and sustainable development of forest ecosystems". The verb is missing.