

Interactive comment on “Hydrogen isotope fractionation affects the identification and quantification of tree water sources in a riparian forest” by Adrià Barbeta et al.

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In this study, Barbeta et al. applied stable isotope techniques to investigate potential water sources of two broad-leaved tree species in a temperate, riparian forest. For this purpose, they made collection of a season-long dataset of $d_{18}O$ and dD compositions from tree xylem water, soil water at different depths, and other potential water sources. They show for both of the tree species that different water sources can be appropriately identified with oxygen isotope data. However, the same conclusion cannot be drawn from hydrogen isotops, as dD of xylem water on many occasions apparently fell out of the range as encompassed by the potential sources. The authors made a detailed

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discussion of several possible causes of the observed xylem-soil water δD mismatch, and concluded that isotopic fractionation in the unsaturated zone and/or within plant tissues could well be the driving mechanism.

This is a well-designed field study that addresses an important topic in stable isotope ecohydrology. The manuscript is well written, and data analysis was carried out in a solid manner. The finding of δD fractionation in two commonly occurred temperate tree species is a timely reminder that this phenomenon may not be an exception as previously thought, only restricted to a narrow range of species such as mangroves or species from arid regions, but more likely one that is common to a wider range of species. This finding will have important implications for stable isotope ecohydrological and ecophysiological studies.

1. Line 232: There is a lack of explanation of the rationale behind the modeling exercise of using SW-excess corrected δD . As far as I understand, given the possibility that fractionation occurs at the soil-root interface or within plant tissues, the purpose of applying such type of correction is to obtain real δD values of the water that is available for uptake by plant roots (i.e. correcting δD back to the point before fractionation occurs). If this is the case, then an apriori assumption for doing correction based on a SW-excess line would be that soil water pools are the only sources of water available for tree roots to take up (otherwise an observed “apparent” SW-excess could have been caused by contribution from non-soil sources that do not necessarily follow the SW-line). Was such an assumption met in the present study? How general applicable is this sw-excess based method to other studies? I think it is worthwhile for the authors to discuss further on these important points (this could be done either in M&M or Discussion).

2. Line 272: I understand the authors’ argument for a lack of sensitivity of $\delta^{18}O$ to soil water content here, but still the line “changes in the isotopic composition of soil water with rain addition...” seems somewhat contradictory to what is already stated in Line 269 “rainfall amount. . .had a negative effect on tope soil water $\delta^{18}O$. . .”. Isn’t it like

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saying that “rain addition has a significant effect on d18O” versus “rain addition may not cause sufficient changes in d18O”?

3. Line 164: How often was stream and groundwater collected? This sentence reads as if they were collected every day? Or on every sampling campaign?

4. Line 276: where is the rock moisture data in Fig. 2?

5. Lines 280-284: I'd like to argue here that if xylem water had become progressively enriched due to stem evaporative enrichment over the past winter, we would expect xylem water to deviate not only from the LMWL line but also from SWL. Yet, from fig. 2 soil and xylem water appear to fall into pretty much the same line.

6. Line 346: change “have also reported isotopic offsets” to “have also been reported to display isotopic offsets”

7. Lines 360-361: Is there also a possibility that cryogenically extracted soil water does not truly represent bulk soil water? See a recent Ecohydrology paper by Orłowski et al. (2016) Critical issues with cryogenic extraction of soil water for stable isotope analysis

8. Line 379: change the second comma to semicolon

9. Line 381: “fore example” should be “for example”

10. Line 387: “sympastic” should be “symplastic”

11. Line 444: this is not a complete sentence

12. Line 445-446: The idea is great, but may not be easy to realize with the current extraction based method that is only capable of extracting bulk water from a plant tissue. Methodological advancement is apparently needed to confer ability of separately analyzing water from different pools (i.e., parenchyma cells versus xylem water) within a given plant sample.

13. Line 448: change “fraction” to “fractionation”

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14. Fig. 5: minus signs are missing in several places of the y-axis

regards,

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