Review for
MS No.: egusphere-2022-45
Title: Water Use Strategy of Riparian Conifers Varies with Tree Size and Depends on Coordination of Water Uptake Depth and Internal Tree Water Storage
Author(s): Kevin Li and James Knighton

Summary

In this work, authors collect data from 30 trees and soil (3 locations, 8 points along the depth), groundwater (4 locations) in Eastern hemlock over a period of 7 months, as follows:

1. **Xylem cores and truck storage** from 30 trees on a monthly basis (**a total of 210 xylem samples**). **55 of these samples** were also used to estimate **trunk storage**: xylem cores were rehydrated in tap water and used to estimate average turgid water content of hemlock tissues. This average turgid water content along with dried and fresh turgid water content were used to compute relative water content of trees

2. **Root mass and distribution** obtained from soil cores from 3 location at depths 5, 10, 20, 30, 40, 50, 75, and 100 cm (**168 samples to evaluate the root mass**). These soil core samples were dried and used to evaluate the rooting depth.

3. **Bulk soil samples** in these three locations at depth 5, 10, 20, 30, 40, and 50 cm on a monthly basis (**132 soil water samples**).

4. **Ground water table** has been observed **every 15-minutes** at four different locations (two sites were in close proximity of where soil samples were collected to evaluate water isotopic composition and root mass).

5. **Other data:** soil water content at depth of 12 cm was collected on a monthly basis at soil sampling sites. Precipitation isotopic composition data was collected on a daily and event-triggered basis.

The authors compared this soil and xylem isotopic composition data against tree tissue relative water content investigate the correlation between the depth of root water uptake and trunk water storage. They use similarity between xylem isotopic composition and rest of measurements as an indicate for the depth of root water. Their work highlights the need to consider physiological heterogeneity and call for a unified standardized field sampling too to improve understanding of tree water use strategies.

My comments are as follows, and I hope they help to improve the quality of your work.

General comments

While is good in this work, the following points can substantially be improved.

- The introduction needs a very careful rewrite for a stronger expression of the motivations for this work. A much better statement of what are the knowledge gaps filled in this work, and why it is important to fill this gap. A good introduction for this conceptual data analysis should provide a deep and independent understanding of mechanisms that connects each element (subject to analysis) in this study and which other influential elements are left out due to various limitation and why their exclusion is not debilitating this study (in terms of filling its knowledge gaps). Also, a clear expression of the knowledge gaps filled by this study is missing.

- The choices on type as well as spatial and temporal resolution of data collection is supporting this analysis and make the tools tailored to answer the research questions in this study. Figure 1 indicates you have made your choices with care, but it is not reflected in your text. I suggest addition of a separate section named "design of study" or something of this kind to address and justify in detail this topic (more in specific comments). And questions like, why a particular subset of xylem cores were chosen to account RWC can be answered.

- Paper can improve on robustness of results and conclusions. Even though the approach applied in this research work is sensible, the analysis to challenge/state the limitations of the tools and inferences made from the analysis can be improved.

Specific comments

Line 52: the term "organisms" to refer to tree may be a misleading terminology, I'd suggest using "species" instead.

Line 55: "subsurface" and "would" seems redundant.

Line 56: Please, cite the research study that has concluded "understanding of how foundational tree species help to understand forest responses to external stressors" If no such work has shown this, please, remove this statement.

Line 71: I am not sure if xylem resistance and access to stable water sources are interrelated (the term "closely related" gives such an impression). Also, they are not the only important factors (you are excluding vapor pressure deficit and atmospheric demand). Also, I am not sure if stable access to **subsurface** water is what only matter as you are considering for instance tree water storage capacity in this study. So please, reword this part more carefully.

Line 72: "there is evidence" and "shift" are repeated in two subsequent sentences, please, reword.

Line 75: there is a gap, perhaps, make the link stronger by first addressing the relation between stable access to water sources and water table depths and adapting strategies in trees to improve.

Line 76-83: same here. There is a gap, and you lose your audience here. As this information are not slightly disconnected from what has been previously said in your intro. Also, the link between this part and the last sentence in this paragraph is not immediate. I suggest rewrite.

Line 86-96: here you address stomatal regulation as an important mechanism to be understood. 1. Do you address or does your work create improved understanding of this mechanism? If not, why do you mention it in this paragraph. 2. How is it related to the two mechanisms stated in the previous paragraph? 3. Do you quantify "the relative importance of these variables" in this work? If not please, do not suggest it as a knowledge gap.

Line 99: replace "between" with "among".

Line 110: please avoid using "these hypotheses" and in more detail your tools and avoid descriptive adjectives (such as high resolution) for improved clarity.

Line 129: you can add "creating a relatively wet condition" after stating the precipitation to let your reader develop better sense of the hydrological conditions.

Line 131: "breast height (1.37m aboveground)" instead of "breast height"

Line 132: It would have been very beneficial if in the intro you would have explained the expected relation between DBH in trees with varied elevation and distance from stream. And here you would have addressed why it is important to create a sampling population where no correlation between DBH and tree elevation or DBH and horizontal distance exists among these variables.

Line 132-149: if there is any particular reason for the choice on sampling location and resolution (for trees, soil, and groundwater level), please, mention it. Why two of soil sampling sites and two of the sites monitoring groundwater level coincide? Why soil sample is collected at depth 12 cm? why soil isotopic composition has not been collected from same depth as you have collected samples for evaluating root mass? Why groundwater level is studied at 15-minutes resolution? Why 100 cm is the deepest point you are collecting soil sample to evaluate the root depth? Is there an indication that trees of a certain age won't exceed this rooting depth? If your choices of sample collected (location and

time) are random, please specify it clearly and mention why you believe, these choices do not bear an impact on your analysis. You can address this topic under a separate section as "design of study".

Figure 1, part b: it is not clear how the size of circles representing hemlocks translates to their DBH or elevation. If circle size chosen here are consistent with what is shown in part (a) please specify it with a clear statement of which variable of hemlock trees they are presenting.
Line 154-160: please explain how you expect your method of storing sampling and time to analysis not affecting the isotopic compositions used in your analysis and shown in your results.
Figure 2:
panel (a), please distinguish the maximum and minimum of daily temperature by a light red and dark red color, and add it to the legend. Also, I think the precipitation itself is better than its cumulative form as it enables better comparison and judgement of your results and analysis and inference in Figure 3. Also, read your own sentence on line 221
Please add your key message for each panel, e.g., panel (c) measured root mass indicates uniform root distribution.
Panel (c), I think using root mass along depth will help you convey your key message for this panel better.

Line 196: rephrase for clarity and replace the word "below".

Figure S4: can you include your explanation on why on 3/12/21 the lc-excess is more negative compared to all other dates?
Line 206-7: not necessarily, because you can see clearly the isotopic composition in precipitation is also more similar to that of soil in June-July.

Figure 4: is better to be rearranged, it is too much information and somehow hard to follow. Again, key message is missing in caption.

Line 216: rephrase for clarity. And avoid over using the word significant.
Line 218: explain much better what does a negative and positive correlation mean and why.

Line 242: I strongly recommend for this section to come much earlier, and explain very well how RWC in each season may be correlated with precipitation (and water stored in soil), transpiration and root water uptake.

Line 284-286: would this not be an indication that classifying tree species based on age, may be a misleading approach to present physiological heterogeneity within or among tree species?

Discussion and Conclusion: I think more emphasis can be placed on the uncertainty in your findings and what needs to be done to add to the robustness of your results. For instance, how do you justify that your sample size is enough to add to the robustness of your conclusions. I suggest an emphasis on physiological heterogeneity rather than the emphasis on age in trees.