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Title: The degree and depth limitation of deep soil desiccation and its impact on xylem hydraulic conductivity in dryland tree plantations

Author(s): Nana He et al.

MS type: Research article

Iteration: Revision

Comments from handling editor:

Dear Xiandong Gao, dear Nana He, dear co-authors,

Reviewer 3 now has assessed your last revision of the manuscript and is satisfied with your changes. Thank you for your work on those comments. I think the manuscript has improved and could be accepted, except for one main problem which still remains.

As an editor it is my role to ensure that the manuscript is accessible, the methods and results support the conclusions and the abstract properly reflects the contents of the paper. I say this to underline that my suggestions are not language improvements (copyediting comes at a later stage), but refer to the scientific integrity of the manuscript. Therefore, I need to insist on the change of nomenclature, as I find the current wording highly misleading. Please see my comments below this email.

Once you have implemented those changes, I think the manuscript is ready to be accepted. Please support me by submitting a version with tracked changes. Thank you!

Kind regards,

Anke Hildebrandt

Response: Thank you for investing a lot of effort and time in our paper. We have read through the comments carefully and responded to all comments as follows. Concurrently, the relevant parts of the manuscript have also been modified and/or corrected in a revised version. We hope that the revisions in the manuscript and our accompanying responses will be sufficient to make our manuscript suitable for publication in *Hydrology and Earth System Sciences*.

I understand that we disagree on the change of terminology from „depth limitation“ to „maximum root water uptake depth“. For matters of brevity and consistency with the other term „moisture limitation“, you prefer to keep the term „depth limitation“ and state that it is properly defined. I disagree. I find that the phrase „depth limitation“ is highly misleading. „limit“ refers to a boundary that can be reached from one side of the variable space. Here you do not refer to a boundary, but to an ecosystem property (maximum root water uptake depth) and I must insist that the wording is in line with the actual meaning. The reason being, that the wording may confound different situations: You could for example refer to a situation, where root water uptake shifts between topsoil and subsoil depending on the season and is *limited* by the maximum root depth. Or to a situation where geology *limits* rooting depth. Here, you refer to the long-term realized uptake depth, not any of the limits as in the examples above. The name should reflect this. If you like, for brevity, you can call it „root water uptake depth“ instead of „maximum root water uptake depth“.

Response: Thank you for your patient explanation, and we agree with your modification suggestions. To avoid misleading, we have replaced all “depth limitation” in the text with “the maximum RWU depth”.

Furthermore, there is still conceptual error in the wording now in Lines 245-246.

„If the difference of soil moisture content in the plantation and its' control becomes not statistically significant ($p > 0.05$) at a given layer, it is defined that the maximum RWU depth is reached.“

I believe you mean the following:

„If the difference of soil moisture content in the plantation and its' control becomes not statistically significant ($p > 0.05$) at a given layer, it is defined that this depth corresponds to the maximum RWU depth .“

Note, that the meaning of the two sentences is different. In the original sentence you say that some threshold is reached. The alternative option simply states how you determine the root water uptake depth.

Response: Thanks for your suggestions. We have modified this section as follows (Lines 249-250).

“If the difference of soil moisture content in the plantation and its’ control becomes not statistically significant ($p>0.05$) at a given layer, it is defined that this depth corresponds to the maximum RWU depth.”

The problem with the use of the term „depth limitation“ becomes obvious, for example, in the abstract, line 7, where you state:

„when the moisture and depth limitations were reached, the native percentage loss of hydraulic conductivity of planted trees’ branches xylem reached 74.9-96.5%, ...“

I do not agree with the term depth limitation is „reached“, because whether it is „reached“ or not is simply a methodological issue, e.g. whether the maximum uptake depth lay within the measured part of the soil profile or not. Currently, the abstract does not mention this. Instead, the wording could easily be misread to state that the root water uptake had reached some critical threshold. The latter is not supported by the results.

Response: Thanks for your suggestions. We have revised this sentence as follows (Lines 28-30).

“Furthermore, when the moisture limitation and the maximum RWU depth were reached, the native percentage loss of hydraulic conductivity of planted trees’ branches xylem reached 74.9-96.5%.”

Please also check the following instances in the manuscript for similar conceptual problems:

Line 349-351: „, .. indicating that the risk of mortality for R. pseudoacacia in Mizhi is greatest when deep-layer soil desiccation reaches the moisture and depth limitation thresholds.“

It is unclear what threshold is meant here and how it is determined? Please rephrase.

Response: Thanks for your suggestions. We have revised this sentence as follows (Lines 354-357).

“Additionally, the NPLC of *R. pseudoacacia* trees in Mizhi was significantly higher than that in other places ($p<0.05$), indicating that the risk of mortality for *R. pseudoacacia* in Mizhi is greatest when the moisture limitation reached and water extraction become difficult due to the maximum RWU depth is deeper.”

Line 444-446: „Furthermore, except for the *R. pseudoacacia* forests in Mizhi, all plantations have reached the depth limitation of deep-layer soil desiccation. After reaching the moisture and depth limitation thresholds, plantations of different sites suffer varying degrees of embolism.“

Mizhi clearly also has a maximum root water uptake depth, except that it was not observed for methodological issues. In the current wording, the sentences are not supported by the results. Please rephrase. I agree, if you argue based on deeper and shallower root water uptake depth.

Response: Thanks for your suggestions. We have revised this sentence as follows (Lines 451-454).

“Furthermore, except for the *R. pseudoacacia* forests in Mizhi may rely on deeper soil moisture, all plantations have reached the maximum RWU depth within the depth of this study. After reaching the moisture limitation and the maximum RWU depth, plantations of different sites suffer varying degrees of embolism.”

Please check grammar:

Line 309-310: please check first sentence for grammar, as the meaning is currently unclear.

Response: Thanks for your suggestions. We have reorganized this sentence as follows (Lines 313-315).

“Based on the measured and literature data, we analyzed the maximum RWU depth of

plantations that reached the moisture limitation of deep-layer soil desiccation in different regions (Fig. 5).”