Authors' responses to the comments of reviewer#2

>>The table and figures are lacking important information. Explanation for abbreviations is widely missing. All figures need to be explained better in the figure legends, not just in the text. A lot of information can be only found in the text, see e.g. information in lines L189, L209-210. The legend of Fig. 4b for instance is not referring at all to the flow path length (x-axis of the figure).

We will make sure to add the missing information in the revised version of the manuscript.

>>It would be great if the figures would also use/refer to the abbreviations from the equations for better understanding.

We will incorporate these suggestions into the revised version.

>>The connection between 1 Introduction, 1.1 and 1.2 should be made clearer. The relevance of 1.1 and 1.2 only get clearer when the objectives (1.3) are listed. Some sentences at the end of section 1 should introduce 1.1 and 1.2.

We will rework the mentioned sections for the revised version of the manuscript.

>>How is the variation within a xylem class? Looking at Figure 4, also the trunk side of the sampled tree mattered. Figure 3a assumes no large variation within the xylem class? This point of variation within a xylem depth class should be also discussed.

The variation within xylem depth classes is depicted in Fig. 5b and 5c and it is described in lines 201-203. The trunk side brings up a complex issue which was neglected within the initial manuscript. We have found two studies (Kozlowski & Winget 1963 and Waisel et al. 1972) which have investigated how a dye tracer injected to a certain sector of the stem is propagated throughout the xylem. A straight sectoral propagation of the dye signal seems to be far less common than spiraling and increasingly spreading propagation patterns. This means that a sectoral analysis of the apparent transport velocities derived from dye tracing experiments like the one presented in this study could be problematic and lead to misinterpretations. This issue will be included to the discussion of the revised version of the manuscript.
The velocity distributions that are used for Figure 3a assume sectorally homogeneous velocity distributions for each depth class that resemble a normal distribution, as described in lines 160-165, which are idealized, but similar to the observed distributions which are shown in Fig 5b.

>> Will you share your codes with the community?

After some cleaning and commenting, the processing scripts with some example input files will be made available to the community.

Responses to (some of) the line by line comments

>>L3: you only study the plant water uptake/transport starting from the stem base

That is correct - even though it stands to reason that water transport through the roots also cannot be instantaneous, it is probably better to focus the abstract more on what was investigated within this study.

>>L79: CVD abbreviation not introduced

We will add that abbreviation to line 69, where it should have been introduced.

>> L82: the borehole method likely only sees the last few cm of the borehole before the airstream is carried out of the stream

We will add the distinction between deep and short cores at that point and make sure that the borehole method will be introduced as an example for the short core case.

>> L115: Figure 2, could you add a scale as a reference?

>> L118: how big is one pixel?

We will add a scale to Fig.2 and we will also add the approximate size of one pixel.

>> L120: how were the classes defined exactly? Be more precise. Why six classes? I would already add "(Fig.2c)" here

The classes where defined as six equally spaced distances classes from the xylem edge. The number of classes was chosen as a compromise between spatial resolution and signal to noise ratio. We will make sure to add this information to the revised version of the manuscript.

>> L124: might be nicer to write „Eq. 1" etc. As you also reference to them later.

We see the point, but since we used the official Latex-Template provided by Copernicus, we are not sure whether it is up to us to deviate from the official layout. Maybe the editor can answer that question?

>> L133: „required velocities u_n to reach"

We will add this to the revised manuscript.

>> L152: add more information „does not matter because…"

What we mean is that the hypothetical stem segment has an arbitrary size. Its length does not matter for the consideration of the velocity distribution at any cross section. We will rephrase the introduction of this section…

>> Figure 3; four different kinds of tiny circles? do you mean shapes/colour groups?

We will rewrite the caption of Figure 3 to make it clearer.

>> L160-165: explain / reference the choice for innermost=0, outermost decreases again

We based this on the observed pattern of our dye tracer model. Similar velocity distributions, based on distributed sap flow measurements, have been observed by Lüttschwager & Rainer 2007 and Čermák et al. 2008. We will add these references.

>> L170: "any study"

>> L172: „different xylem sampling approaches will capture"

>> L174. intercomparison, inter-comparison reads nicer

We will gladly take these comments into account for the revision of the manuscript.

>> L185: how much was the thicker end of the stem?

The thicker end of the stem had a diameter of 38 mm.

>> L186: you could add „Eq. 6"

We will add that reference.

>> L194: „virtually" is confusing here as this is the actual experiment

We meant this in the sense of "practically", "almost" or "nearly". We will rephrase that part to avoid confusion in the revised manuscript.

>> L199: equation 2.1.2??

That was supposed to be "Eq.6" – misplaced a label within the LaTeX source file…

>> Fig.5 legend. „per xylem depth class", (c) is actually the xylem radius (be more consistent)

Each xylem radius is falling into one of the depth classes. We tended to use the two terms interchangeably throughout the whole paper. Upon your comment we see how this can lead to confusion, especially if a single Figure is contemplated with no further context than its caption. We will make sure to be more consistent in the revised version of the manuscript.

>> Fig.6 Frequency: y-axis labels

The absolute numbers on those y-axes do not matter, since they completely depend on the respective resolution of the number of points "sampled" along the x axis. That's why we chose to

omit specific values on the y-axes. Would you prefer to see some arbitrary numbers on the y-axes or would it be enough to add this information to the caption?

>> L247-251: maybe make two sentences out of this very long one

We will split that sentence in the revised version of the manuscript.

>> L255-L261: mention that velocities can be highly species-specific and size of tree etc.

We will add that information to the revised version of the manuscript.

>> L258: wasn't this even in three heights?

Yes, it was, but the intermediate observation (at breast height) did not add much to the overall results. For the sake of completeness, we will describe the actual instead of the "effective" setup.

>> L265: did you sample your stem for isotopic analysis? so that you could compare it directly?

No, we did not. Obtaining a whole breakthrough curve from drip samples would have required more liquid water isotopic analyses than were available within this low budget experiment.

>> L266-274: these are all different species, might be worth to emphasize this more

We already clearly stated the species for each of the cited studies, but we can of course additionally emphasize, that they were not the same as in our experiment.

>> L285: „more conductive pores" than? be more precise

We will rephrase this sentence in the revised version of the manuscript.

>> L270: start new sentence after "… beech)"

>> L284: phrasing

>> L287: „trees. It is"

>> L288: behave differently

>> L294: overrepresentation, over-representation reads nicer

>> L316: phrasing

>> L316: ?Dubbert, delete"?"

These comments will be considered during the revision of the manuscript.

References

Kozlowski, T.T. and Winget, C.H.:
“Patterns of Water Movement in Forest Trees”
Botanical Gazette, Vol. 124, No. 4 (Jun., 1963)

Waisel, Y., Liphschitz, N. and Kuller, Z.:
“Patterns of Water Movement in Trees and Shrubs”
Ecology, Vol. 53, No. 3 (May, 1972)

Lüttschwager, D., and Rainer, R.:
"Radial distribution of sap flux density in trunks of a mature beech stand." *Annals of forest science* 64.4 (2007): 431-438.

Čermák, J., Nadezhdina, N., Meiresonne, L., and Ceulemans, R.:
“Scots Pine Root Distribution Derived from Radial Sap Flow Patterns in Stems of Large Leaning Trees”
Plant and Soil, 305, 61–75, https://doi.org/10.1007/s11104-007-9433-z, 2008.