

## ***Interactive comment on* “Root uptake under mismatched distributions of water and nutrients in the root zone” by Jing Yan et al.**

### **Anonymous Referee #2**

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I was generally pleased to read through the manuscript titled Root uptake under mismatched distributions of water and nutrients in the root zone. The manuscript sets out to demonstrate that plant roots are still able to operate well under conditions where water and nutrients are partitioned in segregated regions. The article presents a novel and imaginative set up well within the capacity to monitor a vast array of soil and plant physical and philological features. Results for the most part are clear and concise and the writing is very comprehensible. With the praise being said, there are a few critical points that need to be addressed in the manuscript. Most of the points pertain to organization, but a few are on the science itself. The figures are in a strange order. I think the first figure that’s referenced is the last figure in the manuscript, and this makes no sense. There are a lot of subfigures that are never mentioned or mentioned in a strange

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order. I've gone through and make marks regarding these points and recommend that the authors make amendments accordingly. Just have the figures appear as they are mentioned in the text and make sure to mention all of the figures that you are presenting. That is pretty simple. More pertinent is the matter of the science. In particular, the focus of the study somewhat diverges and tries to come back together towards the end of the manuscript. In the beginning, the authors are describing this split column root growth experiment in the context of nutrient acquisition and plant development. The authors then attempt to push the notion of hydraulic redistribution in the results later on. It comes off as a bit shoehorned in. My particular issue with this is that it is that your results might be suggesting a very subtle and highly local redistribution of water. The authors then demonstrate that HR is actually less effective under drier conditions when it would be most needed. Towards the end, I was almost convinced that HR wasn't a relevant topic matter. However, the authors did manage to sway me back in slightly when they were trying to make the argument that it was used for the nutrient uptake. I think the authors need to really focus on the subtlety that they are highlighting with their results and draw from some more fundamental principles to base their arguments. Consider that root nutrient acquisition relies on enzymatic reactions that may require a sufficient quantity of water to enact. I think something simple but fundamental would give this study a stronger foundation for its claims. The study already does a good job of illustrating that roots are not just passively behaving below ground. Their ability to actively take up water and nutrients is already interesting. The authors just have to better reconcile the results in figure 3 a and figure 4 b. They appear contradictory.

My specific comments can be found in the attached annotated manuscript document.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2020-109/bg-2020-109-RC2-supplement.pdf>

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-109>, 2020.

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