Dear Alberto Guadagnini,

we herewith submit the revised manuscript "A thermodynamic formulation of root water uptake" for your consideration.

We have edited the manuscript according to the comments given by the reviewers. Once more, we thank the reviewers for reading the manuscript so thoroughly and pointing out some remaining deficiencies.

In the following we give a list of the comments and changes. In the revised manuscript, changes are marked in blue.

Sincerely,
Anke Hildebrandt

Specific response to comments by the reviewers (Gerrit de Rooij = GdR, Uwe Ehret= UE)

GdR01: Text edits lines 168 to 170
Done

GdR02: Text edit lines 212
Done

GdR03, Eq.3: The value of the density of water need not be given, but if you keep it in that's fine. It just seems a bit inconsistent to give a value of the water density, but not of the gravitational acceleration.
True, we added the value for g.

GdR04, Eq. 3: If you want to be completely rigorous, you have to incorporate the distribution of the water over the vertical of the compartment and multiply the water content at each height with the distance to the reference level to come up with the gravitational energy as a function of height. This brings back the integrals you wanted to avoid. As is stands now, you assume that the water content in a compartment as a function of elevation is symmetric around the mean elevation of the compartment (slightly less strict than the assumption of a uniform water content).

But never mind, if people wish to go into such detail, I suppose they should be able to figure that out themselves. These intricacies are a consequence of your preference for sums over integrals to stress that there is a minimum size (that of the REV) to which your approach applies. I do not think it is imperative to change this by including integrals over the depth interval of each compartment, but is nevertheless good to be aware of the effect of this choice on the rigour of the equations.
Yes. We added a note in the text to comment on this.

GdR05, Eq. 5&6: See my comment above. Usually, 'with' is used to explain a variable in the equation above. Here you present two separate equations, one for a compartment, and the other for the full system of n compartments.
Replaced "with" here and throughout the manuscript. (Eq. 5 & 6 and 14 & 15)

GdR06: Text edit lines 257
Done

GdR07, Eq.8: The matric potential is the 'bulk' potential, as it can be observed so far away from any root that it is unaffected by the flow towards the root, right? Thus, all energy dissipated in the radial flow towards the root, across the soil-root interface, and within the outer spheres of the root is captured by $D_{u,i}$. This is what you are aiming for, am I right?
Yes. But note that this is related to the description in the flow model, which does not resolve radial soil water flow and radial root water flow (not uncommon in root water uptake models). If the flow model allows for separating the two flow path, this yields two dissipations, instead of one, which enter into Equation 11.

GdR08, Line 313: What is 'bulk soil water flow'? Flow between the compartments? Or perhaps flow into or out of compartments other than through the roots. Both types of flow are precluded by isolating (or sealing) the compartments so the ambiguity is not resolved by knowing the compartments are indeed closed. Only when I keep reading I note that you mean 'flow between compartments'. Why not use that term instead?
We changed this accordingly to "flow between compartments"

GdR09, Eq. 16: I think you derived this by solving Eq. 15 for ψ_x, and then summing over all compartments. In that case I do not see where the minus sign before $J_{w,r}$ comes from.
Yes, we did. We added this information to the text. We also removed the minus.

GdR10, Line 387: The word 'potentials' seems to be missing. If that is the case: why plural?
Yes, we changed this to singular and added "potential".

GdR11: Where is Appendix B? Is that Table B1 above?
Yes, we hope typesetting will move this to the proper position.

UE01 page 10, line 633: Equation reference goes nowhere.
Thank you for catching this. We fixed it.