

Reply to Associate Editor Decision of MS bg-2019-466:

Estimates of tree root water uptake from soil moisture profile dynamics by Conrad Jackisch et al.

Dear Chris,
Dear Copernicus Team.

Thank you again for handling our manuscript and recruiting such excellent referees.
We have addressed the technical corrections as follows:

Figure 1B – This might be more clear as “Comparison of several (scaled) soil moisture declines demonstrating a range of Nash-Sutcliffe-Efficiency (NSE) scores compared to an artificial (“ideal”) reference step.”

This appears to refer to Fig. 4B. We have changed the caption as proposed.

Pg7 L11 – the assumption that hydraulic redistribution processes ‘remain active during the day’ strikes me as an unrealistic assumption if the fluxes are plant mediated. If there is some purely physical water movement (capillary flow from a saturated layer, downward flow from a higher soil layer) this might be true, but plant-mediated ‘hydraulic redistribution’ decreases markedly as soon as the plant water potentials begin to fall in the morning (because the water potential gradient drives water up the plant rather than out of the roots).

We agree to the reviewer and have specified the redistribution fluxes as “physical” (now P8L5).
Moreover we added a paragraph to Sec. 5.1 as follows:
With respect to our assumption of nocturnal hydraulic soil water redistribution and its continuation over the day, there remains room for further research and refinement. Especially when hydraulic redistribution is plant-mediated and given the multiple occasions with slightly negative nocturnal soil moisture slopes, our assumption might not hold.

Pg13 L1 – Perhaps it’s worth including one sentence of interpretation here rather than just turning readers loose on the Appendix. Something like “Although higher RWU fluxes were generally associated with more step-like soil moisture shapes and higher NSEs, there were still a number of high RWU days at both sites with poor NSEs, indicating additional complicating factors beyond higher detection with higher fluxes (Appendix Fig. B1).”

Thank you for the suggestion. We have included the interpretation sentence here (P13L1).

Fig 8 & Pg16 L6-12– it looks like most of the ‘simplified RWU’ calculations are actually larger than the hydraulic redistribution-corrected fluxes. Does this mean that most nightly trends were actually negative (rather than positive as shown in Fig 2)? If this is the case, it seems like it is not actually hydraulic redistribution that is at play, but rather refilling of plant capacitance or some such subtle overnight water withdrawal.”

The reviewer definitely has a point here. This further underlines a critical revision of our assumption as pointed out before. We have added a respective paragraph at the end of Sec. 4.4: However, the slightly positive bias of the simplified approach (light blue regressions in Fig. 8 above red regression line) points to cases with negative nocturnal changes in soil moisture. This could also be explained as refilling process of the plant's capacitance.

We came across another minor mistake in our calculations: RWU was not reported in mm but in $\Delta\text{vol.}\%$. To convert the values we have to multiply $\Delta\text{vol.}\%$ with the soil moisture measurement increment of 200 mm. This results in factor 2 values, obviously. Since we did not refer to absolute values until the linear regression (Fig. 8) and since the applied linear regression is not affected by a scaling factor, this error does not have any implications on the outcomes of our study. We have updated all graphs which report RWU in mm/day and we have updated the reduced mean rhizosphere radius in Sec. 4.3. Moreover, we have modified the rhizosphere radius reference statement to existing studies in Sec. 5.2 (P18L13ff.). We have carefully checked all results and provide a Jupyter Notebook along the paper for transparency and own calculations.

Thank you and all the best,
on behalf of all co-authors,
Conrad and Sibylle