

# ***Interactive comment on “Isotopic approaches to quantifying root water uptake and redistribution: a review and comparison of methods” by Youri Rothfuss and Mathieu Javaux***

**M. Sprenger (Referee)**

matthias.sprenger@abdn.ac.uk

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Response by Matthias Sprenger to a Reply cited at the end of the document:

Yes, naturally occurring isotopic compositions of hydrogen and oxygen are linearly linked. However, as you point out in your section 2.1 and 2.2 of the manuscript, this linear relationship between the two isotopes can be different depending on having unfractionated soil water (slope of the regression line in the dual isotope space is about 8) or having fractionated soil water (slopes between 2 and 8). I think that this information as the deviation from the GMWL or LMWL (e.g., described as  $d$ -excess or  $l$ c-excess) would provide additional constrains on the root water uptake depth. I can imagine a situation, where there are two soil depths matching isotopically with the plant isotopes

for deuterium, but there is not a match between soil and plant water oxygen isotopes for the shallow soil depth, because the shallow depth experienced evaporation fractionation, while there is no evaporation signal in the deeper soils. Under that naturally occurring soil water isotope profile, a dual isotope approach would help delineating the root water uptake depth.

Therefore, I am currently not convinced that a dual isotope approach is only interesting when applying artificially isotopically enriched/depleted waters for root water uptake studies. Maybe this aspect of additional information due to the dual isotope relation (d-excess or lc-excess) is worth adding in the discussion. I am not asking to include that in the current modeling.

Comment by Matthias Sprenger during first round of revisions: "Why did you limit your analysis here to d18O, while emphasizing that dual isotope approaches would be preferable on page 12 L4?"

Reply by Youri Rothfuss: "In the text, we write that a dual isotopic framework is only interesting when oxygen and hydrogen stable isotopic composition profiles are disconnected from each other, i.e., when they are not linearly linked, which is the case in between rain events. Therefore with think that a dual isotopic framework only adds value in the context of isotopic ( $^{18}\text{O}$  and  $2\text{H}$ ) labelling pulses across the soil profile to artificially deconvolute oxygen and hydrogen stable isotopic composition profiles (see, e.g., study of Bachmann et al., 2015). As we wanted to compare the different approaches at natural isotopic abundance, we choose to consider one of the isotopologues (i.e.,  $\text{H}_2^{18}\text{O}$ ) only"

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Discussion paper

