Paper under revision in Hydrology and Earth System Sciences Discussion (link)

DISENTANGLING TEMPORAL AND POPULATION VARIABILITY IN PLANT ROOT WATER UPTAKE FROM STABLE ISOTOPIC ANALYSIS

When rooting depth matters in labeling studies





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DOES TALL FESCUE WATER STATUS AFFECT ITS XYLEM WATER ISOTOPIC COMPOSITION ON SHORT TIME-SCALES? (E.G. DEEPER WATER UPTAKE)



Labelled water





DOES TALL FESCUE WATER STATUS AFFECT ITS XYLEM WATER ISOTOPIC COMPOSITION IN SOIL-PLANT HYDRAULICS SIMULATIONS?



Depth (m)

leaf water potential & tiller water isotopic composition









DOES TALL FESCUE WATER STATUS AFFECT ITS XYLEM WATER ISOTOPIC COMPOSITION IN SOIL-PLANT HYDRAULICS SIMULATIONS? Answer: not very much in this setup (grey lines), however rooting depth does!

"Pseudo temporal variability" of $\delta^{18}O_{tiller}$ = population rooting depth variability (observations in red likely picked from swarm-like pattern)

"Actual temporal variability" of ψ_{leaf} = transpiration temporal variability (observations in green likely picked from rollercoaster-like pattern "all plants on board of the same car")"









ROOT WATER UPTAKE PROFILES PREDICTED BY HYDRAULIC AND BAYESIAN APPROACHES DIFFER IN SEVERAL WAYS

No water uptake in shallow layers with water potential below -1.5 MPa



- Substantial hydraulic lift coincident with measured soil water isotopic enrichment
- Wider range of deep soil water absorption due to axial limitation of water transport

Probability density of water uptake only function of soil water composition



- Peak of water uptake concentrated in deeper soil layers







HAPPY TO REPLY TO YOUR QUESTIONS IN THE CHAT ROOM! ③



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Full details in manuscript (under revision in HESS Discussion)

Other useful resources:

Meunier et al. (2018) « Measuring and modeling hydraulic lift of Lolium multiflorum using stable water isotopes »

Rothfuss and Javaux (2017) « Reviews and syntheses: Isotopic approaches to quantify root water uptake: a review and comparison of methods »









