

Workshop 2021 - Water and nutrient fluxes in ecosystems under a changing climate - a tracer-based perspective



**Heidelberger Akademie
der Wissenschaften**

Session 3 - Ecohydrological Storages and Fluxes Mediated by Plants

-Abstract Summary

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groundwater did not contribute or only marginally contributed to tree transpiration. Overall, our results suggest that trees along the hillslope mainly rely on water stored in the unsaturated zone and that seasonally shallow groundwater table may not subsidize water uptake for species not tolerating anoxic conditions. Contrary to previous studies, we did not find higher sap velocity downslope as the subsurface hillslope structure promotes vertical water flux over lateral redistribution in the vadose zone.

Multi-isotope labelling reveals different patterns of uptake and transport of water, NO₃ and NH₄ in a poikilohydric epiphytic fern

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Abstract

The Hymenophyllaceae are epiphytic ferns with unique traits among vascular plants. Their fronds have only one layer of cells, they lack stomata and they are desiccation tolerant. Previous evidence suggests that rehydration may be faster through the leaves than through the rhizome, and the acquisition of nutrients in this family is unknown. Here, we present first results from a water+nitrogen isotope labelling experiment, aimed to determine their water and N source. Fronds and rhizomes of specimens from *Hymenophyllum tortuosum* were immersed in 1 mg/L N solutions with contrasting isotope composition: natural abundance (H₂O +NO₃NH₄), DHO+¹⁵NO₃NH₄, and DHO+NO₃¹⁵NH₄. Results from DHO labelling suggested similar water uptake in rhizome and fronds, but higher transport rates from the frond to the rhizome than viceversa. However, the results were inconclusive, since we also observed indirect labelling of unexposed control plants through atmospheric water uptake. With regard to N, we found similar uptake and transport rates in fronds and rhizomes, but contrasting patterns for NO₃ and NH₄. Whereas the uptake of labelled N in the immersed part (¹⁵N-excess) was ca. 10-fold larger for NH₄ than for NO₃, transfer to the unexposed part (¹⁵N-excess ratios) was ca. 30-fold larger for NO₃ than for NH₄. Although preliminary, our results indicate differential ability for uptake and transport of NO₃, NH₄ and water, which we expect to confirm through in-field labelling experiments.

Spatio-temporal variability in tree xylem water isotopic composition of a multi-species forested catchment

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