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

Session 3 - Ecohydrological Storages and Fluxes Mediated by Plants

-Abstract Summary

Session Chair:

Dr. Maren Dubbert, Uni Freiburg, Germany
Prof. Dr. Arthur Gessler, WSL, Switzerland

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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

Authors

Flores-Bavestrello, Alejandra; Escandón, Antonio; Sáez, Patricia; Sancho-Knapik, Domingo; Gil-Pelegrín, Eustaquio; Peguero-Pina, José Javier; Ferrio, Juan Pedro

Speaker

Flores-Bavestrello, Alejandra (alejandrafloresbavestrello@gmail.com)

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 inmersed 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 inmersed part (15N-excess) was ca. 10-fold larger for NH4 than for NO3, transfer to the unexposed part (15-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

Authors

Fresne, M.; Chun, K.P.; Hrachowitz, M.; McGuire, K.J.; Schoppach, R.; Klaus, J.

Speaker

Fresne, Maëlle (maelle.fresne@list.lu)