



## Isotopic enrichment of stable isotopes ( $^2\text{H}$ and $^{18}\text{O}$ ) in the soil-plant-atmosphere continuum: Implications for seasonal water uptake and evaporation patterns in a semi-arid environment

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### **Abstract**

The Niipele subbasin in northern Namibia comprises forest and shrub land where evaporation pans are embedded and the white aeolian sheets sand are overlain by pale red longitudinal dunes (Miller et al., 2010). During the dry season evaporation strongly alters the isotopic composition of soil pore water whereas root water uptake should have no influence. The isotopic composition of xylem water is an integrated measure of plant root water uptake (Ehleringer et al., 1992). This information becomes relevant for an estimation of groundwater recharge especially in dry environments as deep rooting plants possibly utilize groundwater.

We present results from field investigations conducted within the SASSCAL project (Southern African Science Service Centre for Climate Change and Adaptive Land Management) in November 2013 (right before the rainy season) and planned for June 2014 (after rainy season), which are comparing the environmental isotope signals within the soil column, groundwater and xylem water collected from several common tree species in the study area. Soil samples were taken in 10 cm resolution down to a depth of 4 m. Two sites were investigated: (a) with a well draining sandy soil, where xylem samples were taken from several trees (*Baikiaea plurijuga*, *Burkea Africana*, *Terminalia Sericea*), (b) at a sand dune site with calcrete layer at a depth of 1.20 m; here trees and shrub species (*Acacia erioloba*, *Berchemia discolor*, *Burkea Africana*, *Combretum*, *Schinziophyton rautanenii*, *Terminalia Sericea*) were sampled.

All water extractions were conducted cryogenically and subsequently analyzed for  $^2\text{H}$  and  $^{18}\text{O}$  with a Picarro L2120-i cavity ring down spectrometer (CRDS) in the laboratory of the BGR in Hannover. We will discuss novelties as well as shortcomings and pitfalls of the field and laboratory methods.

### **References**

Ehleringer, J. R.; Dawson, T. E. (1992): Water uptake by plants: perspectives from stable isotope composition. In: *Plant Cell Environ* 15 (9), S. 1073–1082. DOI: 10.1111/j.1365-3040.1992.tb01657.x.

Miller R. McG.; Pickford M.; Senut B. (2010): The Paleontology and evolution of the Etosha Pan, Namibia: Implications for terminal Kalahari deposition. In: *Geology Society of South Africa*.