

# MEASURING TREE WATER CONTENT AND LOCATING CONDUCTIVE TISSUES WITH PORTABLE MRI

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The use of MRI in the plant sciences has traditionally been limited due to the immobility of the devices, and restrictions with regard to sample size and shape. To overcome these limitations and to be able to study plants directly in their natural environment, we evaluated the capacities of a portable, unilateral magnet: The Nuclear Magnetic Resonance Mobile Universal Surface Explorer (NMR-MOUSE), designed by Blümich *et al.* [1] and commercialized by Magritek. This MRI device permits measuring the signal in increments of up to 100-micrometers, and within a depth of approximately 25-millimeters. We tested its capacity to measure tree water content by following the dehydration dynamic of cut branches from six different species and two different functional types. We also tested the device on four *in-situ* trees. There was a significant linear correlation between the integral of the MRI profiles obtained and the water content of the branches and trees. This significant correlation was present regardless of tree species or functional type. We then tested the capacity of the device to differentiate the conductive tissues, i.e. the xylem and phloem fluxes, within cut branches. The MRI profiles of the branches presented distinct peaks which corresponded to the xylem and phloem tissues, whose location was validated with x-ray microtomography imaging which allows the high-resolution visualization of the tissues within the sample. In conclusion, the NMR-MOUSE is a promising candidate for measuring plant water dynamics in the field.

## References

[1] B. Blümich, P. Blümli, G. Eidmann, A. Guthausen, R. Haken, U. Schmitz, *et al.* *Magnetic Resonance Imaging* **16**, 5-6: 479-484 (1998)