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► To cite this version:

Shannan Blystone, Guilhem Pagès, Hervé H. Cochard, Pierre Conchon. A portable and unilateral NMR device to measure tree water content and locate conductive tissues. Italian-French International Conference on Magnetic Resonance, Sep 2022, Milan, Italy. hal-03822537

HAL Id: hal-03822537

<https://hal.inrae.fr/hal-03822537>

Submitted on 20 Oct 2022

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A PORTABLE AND UNILATERAL NMR DEVICE TO MEASURE TREE WATER CONTENT AND LOCATE CONDUCTIVE TISSUES

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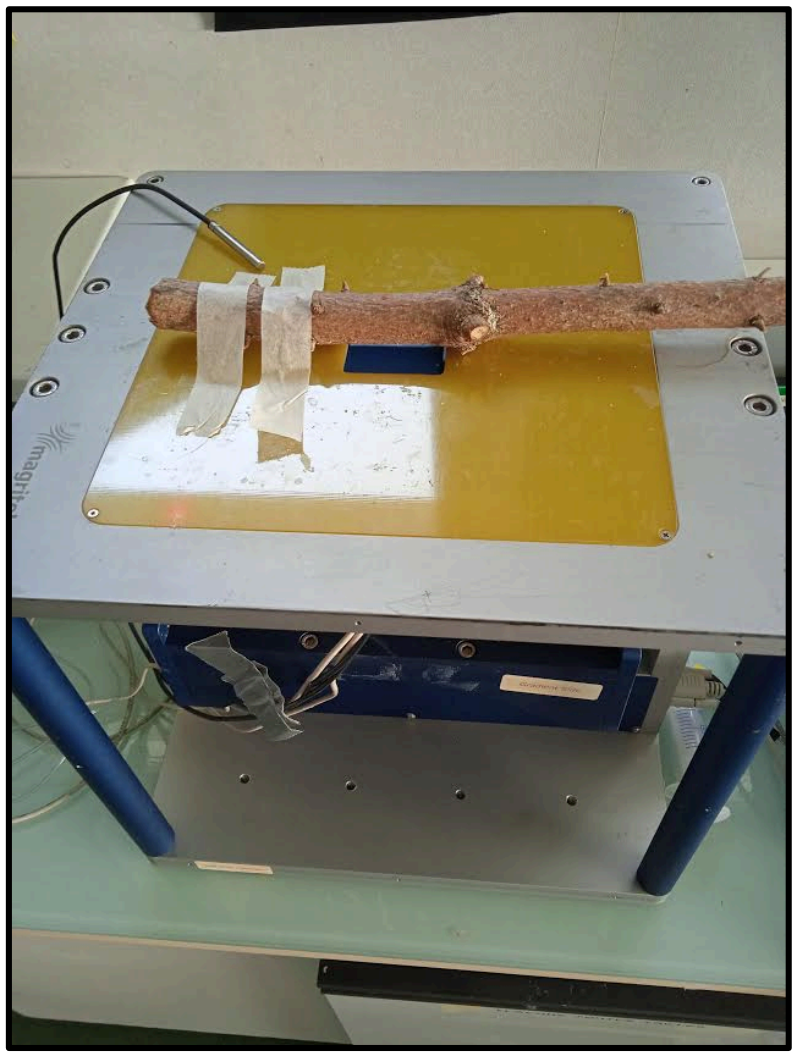
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We evaluated the NMR capacities of a portable, unilateral magnet having the potential to evaluate tree water dynamics *in-situ*: The Nuclear Magnetic Resonance Mobile Universal Surface Explorer (NMR-MOUSE). We tested the capacity of this device to measure tree water content and to differentiate the conductive tissues, i.e. the xylem and phloem fluxes, in the laboratory.

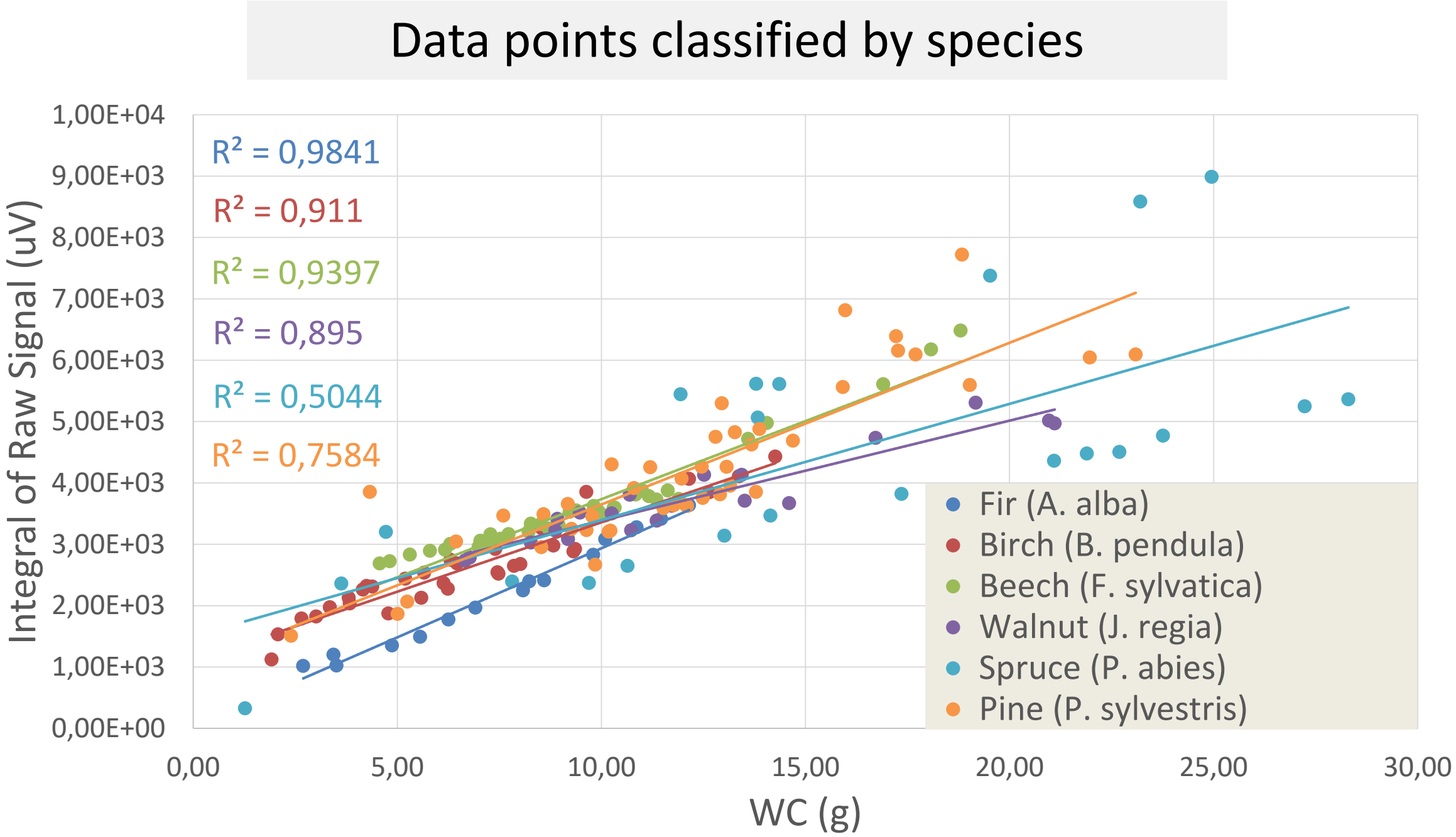
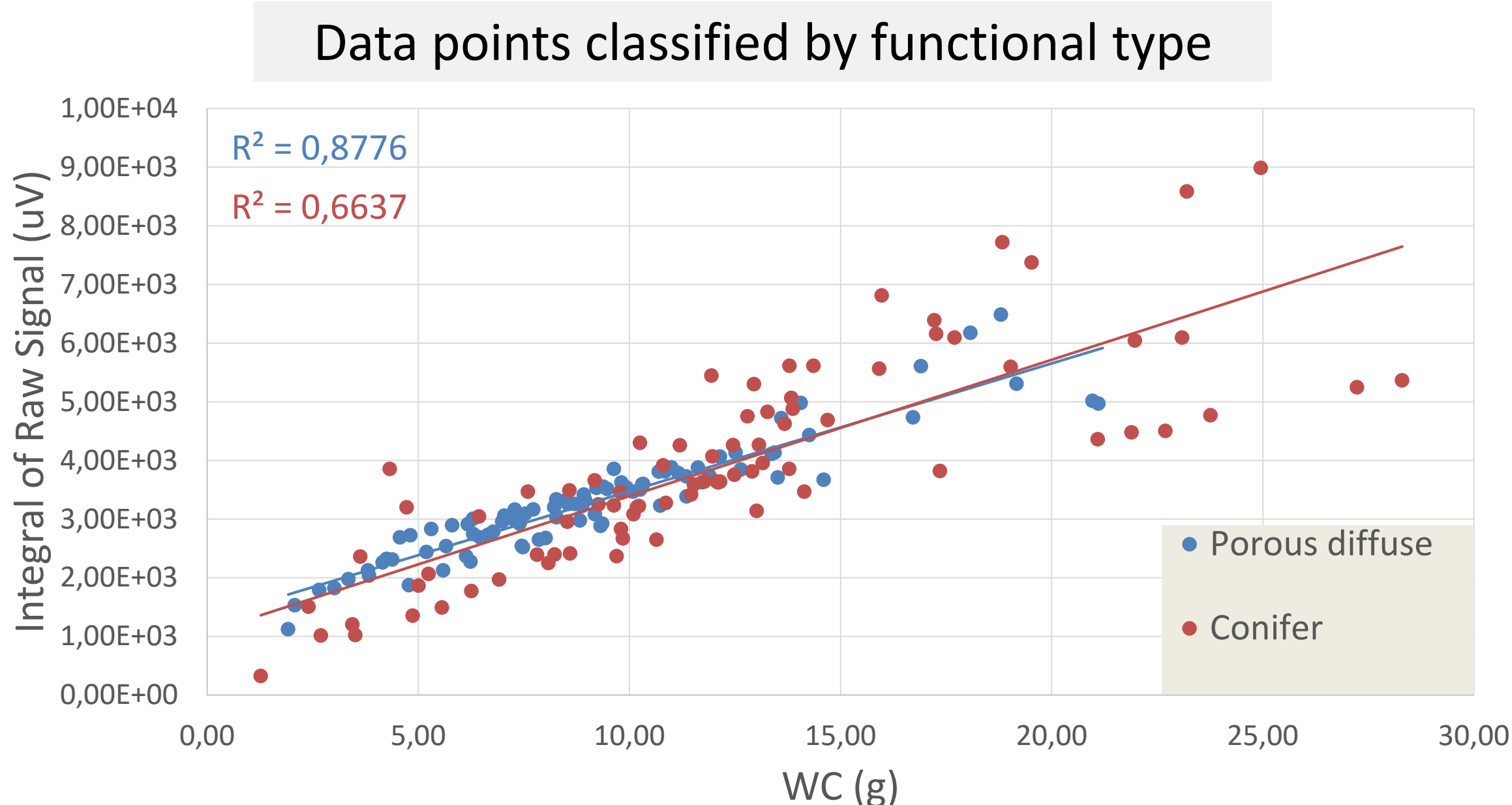
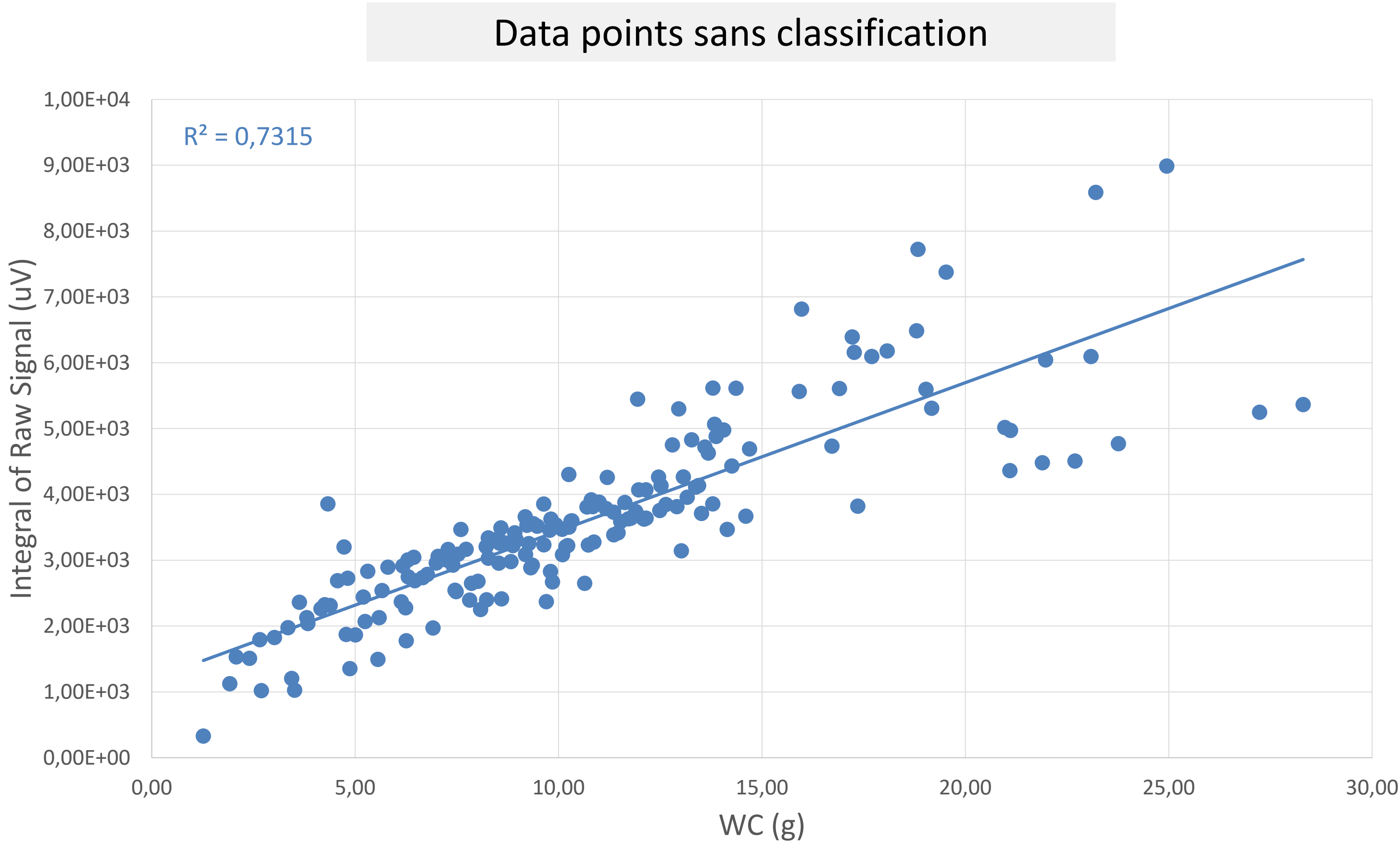
Materials and Methods

- 31 branches were cut, representing 6 tree species and 2 functional types.
- Branches were measured using the NMR-MOUSE immediately after sampling, and subsequently measured again, over time, to follow their dehydration dynamic.
- The water content of each branch was calculated by taking its fresh weight before each NMR measurement, and dry weight at the end of all experiments.
- Three models were constructed to test for linear correlations between water content and the integral of the raw NMR profiles.
- Branches were imaged using x-ray microtomography in order to locate anatomical structures and to correlate them with water peaks on normalized NMR profiles.

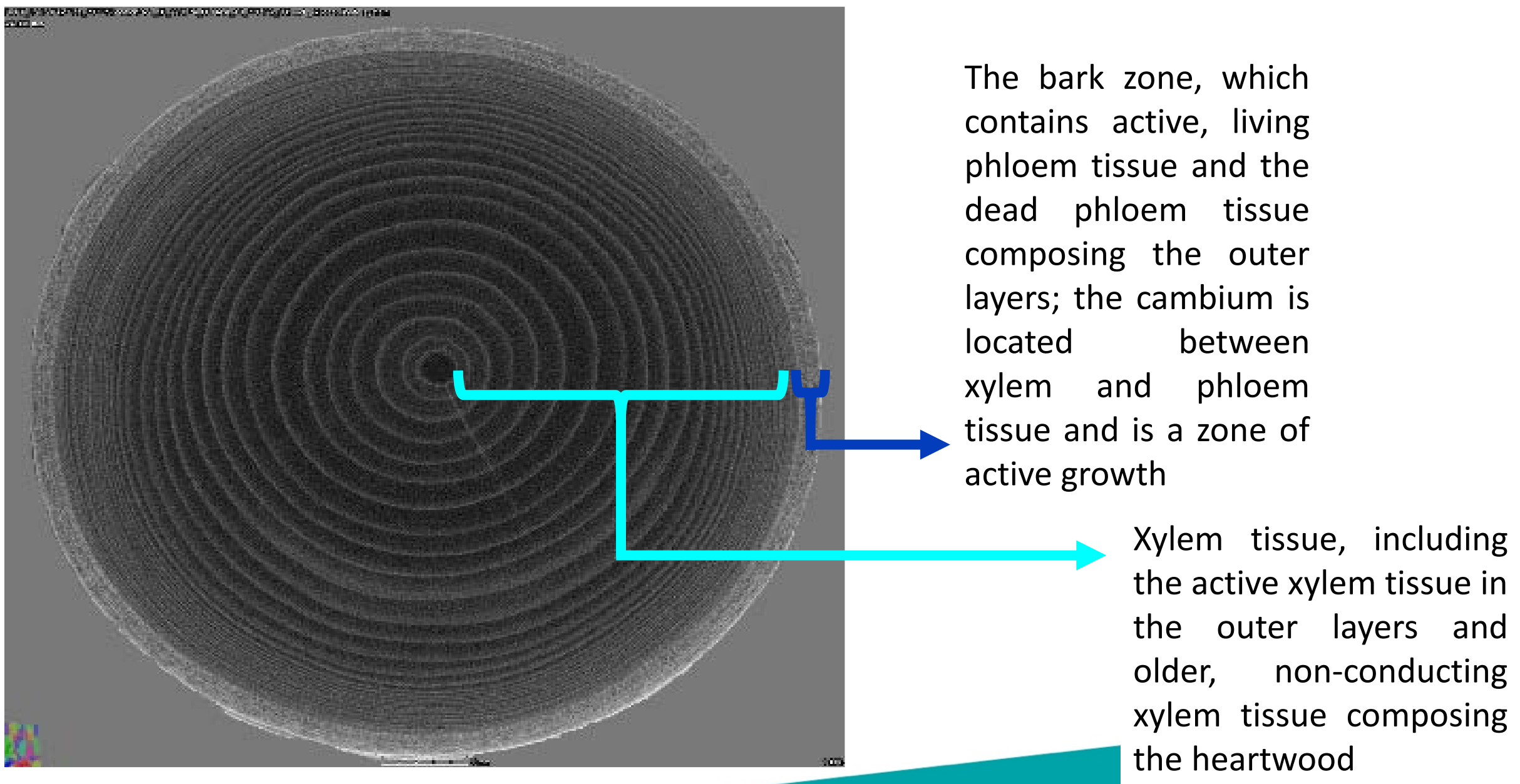
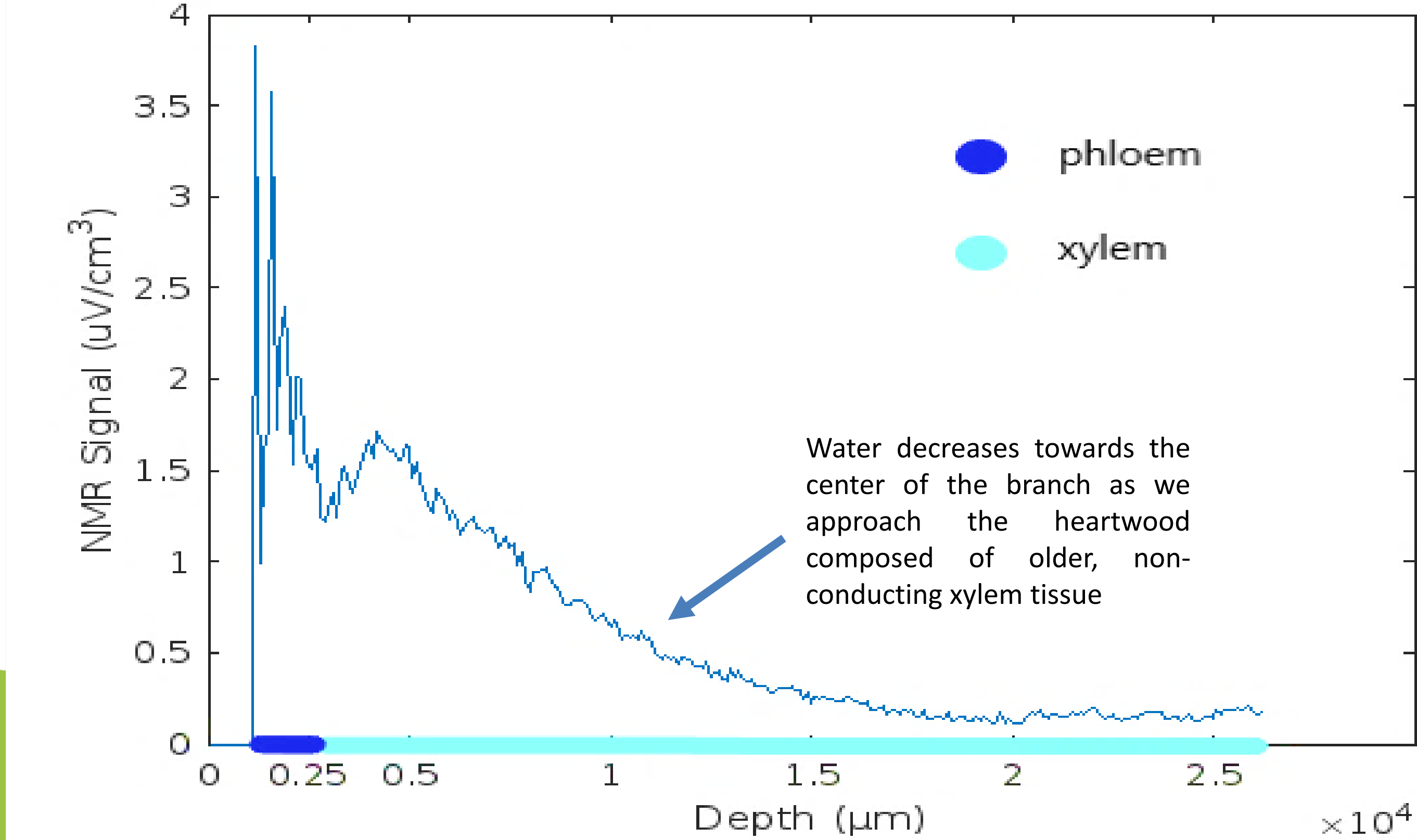


Results

There was a linear correlation between the integral of the raw NMR profiles obtained and the water content of the branches. This correlation was present regardless of tree species or functional type:



The normalized NMR profile of a fir branch (*A. alba*) presenting distinct peaks which corresponded to the xylem and phloem tissues, whose location was validated with x-ray microtomography imaging:



Conclusions and Perspectives

- We were able to observe a linear correlation between the NMR signal and the water content of branches, as well as locate conductive tissues.
- The NMR-MOUSE is a promising candidate for measuring plant water dynamics in the field. Future work will test the capacity of this device to measure tree water content *in-situ*, and to measure the speed of both the xylem and phloem fluxes.