



Evaluation of NMR and other soil water content measurement methods at the point and field scale

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Soil water content in the unsaturated zone is a key parameter of the environmental system. The understanding of soil moisture plays a major role with regard to questions of water and nutrient supply to plants, groundwater recharge, soil genesis and climatic interactions.

In our study we aim to test a new technology for the non-invasive measurement of soil moisture profiles, the so-called Surface-NMR (Nuclear Magnetic Resonance). The instrument applies magnetic fields to the ground and detects its changes caused by mobile and immobile hydrogen atoms in the soil column. Using four different frequencies, the data may provide insights into the water content of four distinct soil layers between the surface and 20 cm depth.

We carried out multiple NMR measurements at four different field sites in Germany and compared the data with conventional methods, such as gravimetric soil samples, Time Domain Reflectometry (TDR), and Cosmic-Ray Neutron Sensing (CRNS).

The dataset will be used to investigate the following research questions:

- Is the Surface-NMR method suitable to provide depth-resolved information of soil moisture under field conditions?
- Does Surface-NMR have the potential to replace or complement conventional methods of soil moisture measurement in the field?
- What can we learn about the spatial variability and scale dependency of soil moisture by combining three measurement methods of different scale (TDR, NMR, CRNS)?