

## **Soil Moisture Measurements with Cosmic-Ray Neutrons**

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An effect, which has been considered for more than 50 years as a detector background, turns out to be one of the promising spin-off technologies to access our most important resource: water.

The method, called cosmic-ray neutron sensing (CRNS), is able to uniquely measure at typical correlation scales of soil water of several ten to hundred meters, which other techniques barely reach. This information is most valuable to support climate modeling and hydrology to direct applications in precision farming, draught monitoring and also snow height measurements.

Although it was known that neutrons created in cosmic-ray induced air showers form a gas above the ground, which can be related to the presence of hydrogen, the lack of computational resources prevented a precise description for the relation of neutron intensity to environmental water. Now, in a recent interdisciplinary cooperation of Particle Physics and Earth Sciences the quest to understand the particle propagation in the soil-atmosphere interface has been solved. With the COSMOS collaboration having meanwhile deployed more than one hundred sensors, the focus is now set to design and build large-scale neutron detectors in order to improve the measurement precision. This talk provides an overview of the detection technologies, Monte Carlo simulation methods and data challenges of CRNS as well as it shall exemplarily show how Nuclear and Particle Physics can give birth to a new and unexpected field of applications.