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## Field scale root zone soil moisture estimation by coupling cosmic-ray neutron sensor with soil moisture sensors

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Since it has become clear that climate change is having a major impact on water availability for agriculture and crop productivity, an accurate estimation of field-scale root-zone soil moisture (RZSM) is essential for improved agricultural water management. The Cosmic Ray Neutron Sensor (CRNS) has recently been used for field-scale soil moisture (SM) monitoring in large areas and is a credible and robust technique. Like other remote or proximal sensing techniques, the CRNS provides only SM data in the near surface. One of the challenges and needs is to extend the vertical footprint of the CRNS to the root zone of major crops. This can be achieved by coupling the CRNS measurements with conventional methods for soil moisture measurements, which provide information on soil moisture for whole rooting depth.

The objective of this poster presentation is to estimate field-scale RZSM by correlating the CRNS information with that from soil moisture sensors that provide soil moisture data for the whole root depth. In this study, the Drill and Drop probes which provide continuous profile soil moisture were selected. The RZSM estimate was calculated using an exponential filter approach.

Winter Wheat cropped fields in Rutzendorf, Marchfeld region (Austria) were instrumented with a CRNS and Drill & Drop probes. An exponential filter approach was applied on the CRNS and Drill and drop sensor data to characterize the RZSM. The preliminary results indicate the ability of the merging framework procedure to improve field-scale RZSM in real-time. This study demonstrated how to combine the advantages of CRNS nuclear technique (especially the large footprint and good representativeness of obtained data) with the advantages of conventional methods (providing data for whole soil profile) and overcome the shortcoming of both methods (the lack of information in the deeper part of soil profile being the major disadvantage of CRNS and the spatial limitation and low representativeness of point data being the major disadvantage of conventional capacitance sensors). This approach can be very helpful for improving agricultural water management.