



Cosmic Ray Neutron Probe Soil Water Measurements over Complex Terrain in Austria

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The importance of surface soil water (rooting zone) has become evident with climate change affecting rainfall patterns and crop production. The use of Cosmic Ray Neutron Probe (CRNP) for measuring surface soil water has become increasingly popular. The advantage of CRNP is that it is a non-invasive technique for measuring soil water content at an area-wide scale, in contrast to more conventional, techniques which measure mainly at field scale (point level). The CRNP integrates over a circular area of ca. 600 meters in diameter, to a depth of 70 cm, giving an average value for soil water content.

Cosmic radiation interacting with the Earth's atmosphere continuously generates neutrons. At Earth's surface, these neutrons interact with surface water, and are slowed down. At sub-micrometer geometrics, these neutrons affect semiconductor devices, so they can be counted, slow and fast ones separately. From the difference in numbers between fast and slow neutrons, soil water content is calculated.

As first in Austria, a CRNP (CRS 1000/B model) consisting of two neutron counters (one tuned for slow, the other one for fast neutrons), data logger and an Iridium modem, has been installed at Petzenkirchen research station of the Doctoral Programme for Water Resource Systems (TU Vienna) at 48.14 latitude and 15.17 longitude, 100 km west of Vienna, in late autumn 2013. The research station is located in an undulating agricultural landscape, characterized by heavy Cambisols and Planosols, and winter wheat and barley as main crops in winter, and maize and sunflower in summer. In addition, an in-situ soil moisture network consisting of 32 stations of Time Domain Transmissivity (TDT) sensors measuring soil water at 4 depths (0.05, 0.10, 0.20 and 0.50 m) over an area of 64 ha has been established. This TDT network is currently being used to validate the use of the innovative CRNP technique. First results will be shown at the EGU 2014.