



Evaluation of Cosmic-ray Moisture Sensing Probe for Measuring Mesoscale Soil Water Content

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Current techniques measure soil moisture either at point or regional scales. The cosmic-ray sensing (CRS) probe, which measures field scale soil water content, bridges the gap between point measurement and remote sensing. The objectives of this study are to evaluate the accuracy the CRS measurements, and to quantify the influences of environmental factors on CRS readings. Soil moistures results from CRS probes were compared to soil water content data from time domain reflectometry (TDR) determined at 5, 10, and 20 cm depth. The results showed that the sensing depth of the CRS probes was within crop root zone (0 - 20 cm), and the measurements from CRS probes agreed well with TDR readings, with an correlation coefficient of 0.78 and root mean square errors within 0.033 m³ m⁻³. The CRS probes are effective for monitoring root zone soil water and can be used for irrigation management. The procedures for quantitatively correcting the effects of lattice water in soil minerals, water in soil organic matter (SOM), and water in vegetation are also presented.