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## Testing the response of proximal gamma ray spectroscopy and cosmic ray neutron sensors to dry and wet conditions in an agricultural field (Spain)

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Gamma ray spectroscopy (GRS) and cosmic ray neutron sensors (CRNS) have become promising proximal soil moisture sensing techniques at intermediate scale in recent years. The high efficiency and relatively good spectral resolution provided by Sodium Iodide (NaI) detectors allow gamma-ray surveys for monitoring the spatial and temporal distribution of terrestrial radioelements like <sup>40</sup>K, which is inversely proportional to the volumetric soil water content SWC (m<sup>3</sup>/m<sup>3</sup>). Cosmic ray neutron sensors detect and count the number of neutrons in the soil and the air just above the soil. Dryer soil has more fast-moving neutrons, while wetter soil has fewer because more hydrogen from water is available to absorb energy.

The objective of this study is to test the response of the proximal gamma ray spectroscopy and the cosmic ray neutron sensor in an agricultural field under dry and wet soil conditions to infer the information of soil water content in the first 30 cm. For the first time in Spain GRS and CRNS sensors have been assayed on a test site of approx. 40 × 80 m<sup>2</sup> (41° 43' 37" N, 0° 48' 46" W) at the experimental farm of the *Estación Experimental de Aula Dei* (EEAD-CSIC, Zaragoza, Spain). The experimental setup is equipped of a Cosmic Ray Neutron Sensor placed at 2 m above the ground located at the middle of the field, and a proximal gamma-ray equipment composed by sodium iodide scintillator detector (NaI). The CRNS provided continuous data every 15 min, while NaI detector supplied data at selected sites before and after a 16-liter rain episode. In this contribution, we present the preliminary results under dry and wet conditions of the distribution of <sup>40</sup>K (cps, Bq m<sup>-2</sup>) and analyse the SWC after performing GRS and CRNS measurements. Our results were also compared with soil moisture estimated by volumetric field sensors showing high sensitivity to the different status of soil moisture, highlighting the promising of the use of these nuclear techniques for environmental and agricultural purposes.