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Assessment of soil water use by grassland by frequency domain reflectometry in the humid area of Spain

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Frequency domain reflectometry (FDR) is becoming increasingly used for indirect water content determination in soils. In Galica, located in NW Spain, the humid region of this country, annual precipitation exceeds evapotranspiration. However, the yearly distribution of rainfall is irregular, so that supplementary irrigation during the dry warm summer is required often. This study aims to evaluate soil water use by grasslands and soil water regime patterns during the warm season from soil moisture measured at successive depths using FDR. The study sity is located at the experimental field of the Centre for Agricultural Research (CIAM) in Mabegondo, latitude 43º14' N and longitude 08º15' W. Soil moisture was monitored at six experimental plots from July to October 2008 two times per week using a portable FDR sensor. Measurements were made from 10 to 160 cm depth at 10 cm intervals. Moreover one of the plots was equipped with a continuous recording FDR-EnviroSCAN probe. Crop potential evapotranspiration (ETc) was estimated according to the of FAO version of the Penman-Monteith equation and the meteorological information required to apply this method was provided by a station located in the place experimental field. Cumulative rainfall along the study period was 195 mm, which is above the long-term mean and cumulative potential evapotranspiration was 264.7 mm. Using the water balance method the total value of actual evapotranspiration was estimated at 205.2 mm. Analysis of soil moisture content profiles allowed a description of soil water regime and main soil water withdrawal patterns under grassland. In general, grassland roots extracted most soil water from the 0-40 cm depth. In contrast, moisture content at the bottom of the profile was close to saturation, even the driest weeks of the study period. Continuous monitoring of soil water content allowed a more detailed characterization of dry and wet periods during the study season. The study data set may be useful for assessing draught risks and supplementary irrigation needs.