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Calibration procedures to test the feasibility of heated fiber optics for measuring soil water content in field conditions.

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This research provides insights of the calibration procedures carried out at the agricultural field of La Nava de Arévalo (Spain). The suitability of the heat pulse theory applied to fiber optics for measuring soil water content, in field conditions, is here analyzed. In addition, it highlights the major findings obtained and the weakness to be addressed in future studies.
Within a corn field, in a plot of 500 m2 of bare soil, 600 m of fiber optic cable (BruggSteal) were buried on a ziz-zag deployment at two depths, 30cm and 60cm. Various electrical heat pulses of 20W/m were applied to the stainless steel shield of the fiber optic cable during 2 minutes. The resulting thermal response was captured by means of Distributed Fiber Optic Temperature sensing (DFOT), within a spatial and temporal resolution up to 25 cm and 1 s, respectively. The soil thermal response was then correlated to the soil water content by using undisturbed soil samples and soil moisture sensors (Decagon ECHO 5TM). The process was also modeled by applying the numerical methods software Hydrus 2D. Also, the soil thermal properties were measured in situ by using a dual heat pulse probe (Decagon Kd2Pro).
For an ongoing process, first results obtained show the suitability of heated fiber optics for measuring soil water content, in real field conditions. Also, they highlight the usefulness of Hydrus 2D as a complementary tool for calibration purposes and for reducing uncertainty in addressing soil spatial variability.