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Soil and Water Research

Comparison of two sensors ECH₂O EC-5 and SM200 for measuring soil water content

Kodešová R., Kodeš V., Mráz A.:

Soil & Water Res., 6 (2011): 102-110

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The goal of this study was calibration of the ECH₂O soil moisture sensor EC-5 and the sensor SM200 for selected soils of the Czech Republic. Based on the soil maps of the Czech Republic and various climatic conditions, five humic horizons of different soil types were selected: Stagnic Chernozem Siltic, Haplic Chernozem, Chernozem Arenic, Haplic Luvisol, and Haplic Cambisol. Soil properties (pH_{KCl}, pH_{H2O}, exchangeable acidity, cation exchange capacity, hydrolytic acidity, basic cation saturation, sorption complex saturation, oxidable organic carbon content, CaCO₃ content, salinity, sand, silt, and clay content, soil particle density, bulk density) were determined using the standard laboratory techniques. Six ECH₂O EC-5 sensors permanently installed in six 606 cm³ repacked soil samples of each soil were calibrated. Four calibrated SM200 sensors were inserted into the same soil samples only when measuring sensor signal. Soil water contents were determined gravimetrically.

parameters of the calibration equations relating sensor signals or evaluated dielectric constants and soil water contents. The multiple linear analyses showed that the parameters of the calibration equations for the EC-5 depended on the bulk density, fraction of sand particles, and salinity. Parameters a and b of the SM200 depended on the initial soil salinity, sand fraction and CaCO_3 content, and on the sand fraction, respectively. The impact of KBr solute (concentrations of 0.01, 0.05 and 0.1M Br) on calibration equations was studied as well. It was found that ECH_2O EC-5 sensor measurements were more influenced by KBr solution than SM200 measurements. In the case of the ECH_2O EC-5 sensor, impact of KBr was lower in soils of higher initial salinity. SM200 measurements were noticeably influenced only when 0.1M Br solution was applied.

Keywords:

bulk density; CaCO_3 ; ECH_2O soil moisture sensor EC-5; fraction of sand

particles; SM200 sensor; soil and soil
water salinity; soils of the Czech
Republic; soil water content

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