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Interactive comment on "Soil moisture and matric potential – An open field comparison ofsensor systems" *by* Conrad Jackisch et al.

Anonymous Referee #2

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This manuscript presents an interesting dataset on field comparison of various commercial soil sensors. The article is mostly well written, but gives only an incomplete overview of the data. The tables and figures could be more informative and a more in-depth analysis is necessary. I general the manuscript gives the appearance of a preliminary draft. Nevertheless, I find that this is a quite unique dataset for studying the difference in performance of soil moisture sensors under field conditions. Please find below my comments that need to be considered before publication can be recommended.

General comments

The comparison of various soil sensors under field condition is a nice complement to laboratory tests (e.g. Blonquist et al., 2005). However, only providing the measurement

data is missing the point as it would be far more interesting to see the result of a performance evaluation of the various sensors. Therefore, I suggest that the authors provide a much more detailed comparative analysis of the sensors using their long-term data. In my view, the publication in ESSD is nevertheless justified as the data set allows interested readers to use the data for additional analysis.

The conclusion section is far too short.

The number of references is very short and the format is not consistent.

Specific comments

L15-16: The authors categorized the tested soil moisture sensors in three groups: time-domain reflectometry (TDR), frequency-domain reflectometry (FDR) and capacitive sensors (Cap). However, none of the soil moisture sensors used in this study is actually a FDR sensor. The term FDR indicates a technique in which a sweep is sent into a cable the complex reflected wave is analyzed with a vector network analyzer to determine the various sources of reflection (e.g. Huisman et al., 2004). Instead of trying to group the sensors in these artificial categories I suggest to name the actual measurement principle. For instance, the SMT100 uses a ring oscillator to measure bulk permittivity (Bogena et al., 2017).

L20-21: You should add that the EM sensors determines effective bulk permittivity, which is closely related to the real part of the dielectric permittivity and that TDR is favorable due to its high operation frequencies (1–2 GHz) because in this frequency range dielectric permittivity is less sensitive to soil texture and electrical conductivity effects.

L22-23: "signal propagation into the soil" is not a technical issue. Issues like "corrosion" are not typical issues of the tested sensors. "shielding" effects are not tested in this study.

L25-26: This sentence does not make sense.

L27: “It measures” is not appropriate.

L40: What is the size of the test site?

L57: Please provide a brief introduction to each of the sensors (e.g. manufacturer, measurement principle, calibration etc.) in addition the table.

L64-65: Why only these three sensors?

L100: Indicate the size of the soil sample. The disturbance with the by the aluminum lide indicates that the sample was too small in relation to the sensing volume.

References

Blonquist, J.M., Jones, S.B., Robinson, D.A. (2005): Standardizing characterization of electromagnetic water content sensors: Part 2. Evaluation of seven sensing systems. Vadose Zone J. 4, 1059–1069.

Bogena, H., J.A. Huisman, B. Schilling, A. Weuthen and H. Vereecken (2017): Effective calibration of low-cost soil water content sensors. Sensors 17(1): 208, doi:10.3390/s17010208.

Heimovaara, T. J. (1994): Frequency domain analysis of time domain reflectometry waveforms: 1. Measurement of the complex dielectric permittivity of soils, Water Resour. Res., 30(2), 189–199.

Huisman, J.A., W. Bouten, and J.A. Vrugt (2004): Accuracy of frequency domain analysis scenarios for the determination of complex dielectric permittvity. Water Resour. Res. 40:W02401, doi:10.1029/2002WR001601.

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