Interactive Discussion: Author Response to Referee #1

The Potsdam Soil Moisture Observatory: High-coverage reference observations at kilometer scale

Elodie Marret, Peter M. Grosse et al.
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RC: ***Reviewer Comment***, AR: *Author Response*, ☐ Manuscript text

Dear Madam or Sir,

thank you very much for your referee report and for the time and effort you invested in reviewing our manuscript, as well as for the helpful suggestions to improve its clarity and grammar. We sincerely apologize for the grammatical issues in the previous version and will carefully revise the entire manuscript for language and readability.

Please find below our point-by-point responses. We plan to address all your comments in the revised version of the manuscript.

Thank you again for your valuable feedback and your support of this process.

Kind regards,
Peter Martin Grosse (on behalf of the author team)

RC: ***L5 – suggest "…for remote sensing algorithm validation due to its ability…"***

AR: Will be implemented.

RC: ***L15 – suggest "The data are available from: https://doi.org/ "***

AR: Will be implemented.

RC: ***L19 – rewrite the first sentence it is very hard to get past without rereading many times. Do you mean "Soil water storage varies spatially and temporally and is critical for understanding the water cycle, fluxes between the land surface and atmosphere…"?***

AR: We gratefully accept the suggestion for clarifying the sentence. .

RC: ***L21 – what is an essential climate variable as defined by Bojinski? Sentence needs explanation.***

AR: We will add the sentence "An Essential Climate Variable (ECV) refers to a physical, chemical, or biological variable, or a set of interconnected variables, that is crucial for defining Earth's climate."

RC: ***L25 – Fix grammar "The main challenges in soil moisture observation are… ???"***

AR: Will be corrected.

RC: ***L34 – suggest deleting "at very specific locations"***

AR: We will change the sentence to "These techniques provide observations at high temporal resolution but due to their small support volume (typically just a few cubic centimeters) at selected locations (Robinson et al., 2008)) only. Thus, due to the aforementioned heterogeneity of soil water content (SWC), their representativeness remains limited.

RC: ***L52 – suggest changing to "…technology has proven to be a valuable method for intermediate…"***

AR: Will be implemented.

RC: ***L58 – suggest "Neutron counts are typically accumulated over several hours, corrected for factors such as air pressure, and then converted to volumetric water content using a custom calibration function."***

AR: Suggestion accepted.

RC: ***Fig 1 – can you make the site numbers a different colour like white so they can be read***

AR: Will be implemented.

RC: ***L138 – are the TDT/FDR measurements field calibrated or are factory default calibration used? This is important as factory default values can be very poor***

AR: The TDT/FDR sensors were field calibrated, as stated in L258–260. The respective information will be added to L138.

RC: ***L173 – the instruments sold by Quaesta are made under licence from Hydroinnova – i.e. they are the same thing. It might be a different model but it's the same technology***

AR: To our knowledge, Hydroinnova supplies its systems with a Quaesta Logger as part of the complete setup. We operate different systems utilizing ^{3}He, Li, and BF_3. Following its merger with Lab-C, Quaesta now distributes systems under its own name. As far as we are aware, all three brands — Hydroinnova, Quaesta/Lab-C, and Lab-C — use Quaesta Loggers.

RC: ***L185 – what correction approaches (pressure, vapour, intensity) and calibration equation have been applied to get soil moisture? NOTE – I now see this section 4 (maybe add a note that it is coming later)***

AR: We will add a forward reference indicating that the correction and calibration procedures are described in detail in Section 5.

RC: ***L200 – A figure comparing the relative intensity of a couple of adjacent neutron sensors would be nice to see if they respond similarly***

AR: Our focus here is on the derived soil moisture, not on the raw count intensity, as the (dis)similarity between stations can be better interpreted on the scale of soil moisture units. Comparative neutron count data are already presented in Heistermann et al. (2023), Fig. 6 showing the similar response of sensors at the site. In the current paper, we provide raw neutron counts in the data files as well as sensor sensitivities in table 2 for interested readers.

RC: ***L227 – fix reference***

AR: Will be fixed.

RC: ***L453 – were not removed?***

AR: Suggestion accepted.

RC: ***L499 – what does 3.6 mean?***

AR: The value 3.6 was a typo and will be removed.

References

Heistermann, M., Francke, T., Scheiffele, L., Dimitrova Petrova, K., Budach, C., Schrön, M., Trost, B., Rasche, D., Güntner, A., Döpper, V., Förster, M., Köhli, M., Angermann, L., Antonoglou, N., Zude-Sasse, M., and Oswald, S. E.: Three years of soil moisture observations by a dense cosmic-ray neutron sensing cluster at an agricultural research site in north-east Germany, Earth System Science Data, 15, 3243–3262, 10.5194/essd-2025-54610.5194/essd-15-3243-2023, 2023.

Robinson, D. A., Campbell, C. S., Hopmans, J. W., Hornbuckle, B. K., Jones, S. B., Knight, R., Ogden, F., Selker, J., and Wendroth, O.: Soil Moisture Measurement for Ecological and Hydrological Watershed-Scale Observatories: A Review, Vadose Zone Journal, 7, 358–389, 10.5194/essd-2025-54610.2136/vzj2007.0143, 2008.