Interactive Discussion: Author Response to Referee #4

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

Elodie Marret, Peter M. Grosse et al.
Earth Syst. Sci. Data Discuss., doi:10.5194/essd-2025-546

RC: ***Reviewer Comment***, AR: *Author Response*, ☐ Manuscript text

Dear Wolfgang Wagner,

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.

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: ***The paper primarily is a comprehensive description of all data collected at the Potsdam Soil Moisture Observatory, and while reading it I felt a certain fatigue towards the end of the paper. To improve engagement of the readers, I recommend incorporating more visualizations to highlight the properties and quality of the different datasets. Additionally, including some exploratory results could make the paper more compelling.***

AR: In response to the reviewers' feedback, the manuscript will be restructured and we will incorporate your feedback as well as some additional figures.

RC: ***Section 6 discusses the validation of the Copernicus SWI product as a use case. However, while the fused ASCAT-Sentinel-1 1 km SWI product is sampled at 1 km (hence its acronym 1km SWI), its effective spatial resolution is much coarser (5–15 km; see, e.g., [DOI: 10.1016/j.jhydrol.2022.128462]). Instead, it would be more appropriate to reference e.g. the 1 km Copernicus Sentinel-1 surface soil moisture (1km SSM) product, which not only has fine sampling but also a high resolution of 1km.***

AR: We agree with the reviewer. In Figure 8, the 1 km Copernicus Sentinel-1 surface soil moisture (1km SSM) product was already shown. We correctly addressed the Copernicus SSM product in the text and in the caption.

RC: ***As noted by other reviewers, the English language needs improvement, particularly in the introductory sections.***

AR: We sincerely apologize for the linguistic shortcomings. We thank the reviewer for this constructive comment and have thoroughly revised the manuscript to improve clarity, grammar, and readability, particularly in the Introduction.

RC: ***In line with RC2's feedback, the section on the Bonner sphere appears out of place and should be rewritten to fit better with the rest of the text.***

AR: We will rewrite and shorten this part.

RC: ***Figure 3: Why is the intense precipitation event in summer 2024 (> 30 mm/d) not visible in the CRNS time series?***

AR: The CRNS-derived soil moisture time series, as shown in Figure 1, does reflect the intense precipitation event in summer 2024. The reason this event is not easily visible in Figure 3 is that the soil moisture data there are aggregated at daily resolution.

RC: ***Figure 3: It would be nice to see also normalized soil moisture values to better compare the time series.***

AR: The primary aim of this paper is to provide the dataset and enable further analyses. We agree that normalized soil moisture values would facilitate comparison of the time series and acknowledge this as a valuable suggestion for future use of the dataset.

RC: ***Line 227: What is an "unfolding procedure"?***

AR: The unfolding procedure involves reconstructing the neutron energy spectrum from the measured neutron count rates of the Bonner spheres through deconvolution of the measurement data. Measurements obtained with a Bonner sphere spectrometer typically provide an indirect rather than direct measurement of the neutron energy spectrum, as the recorded data represent a convolution of the response function with the true spectrum. Deconvolution inverts this process, enabling the determination of the spectrum based on the measurements, the Bonner sphere response functions, and additional relevant experimental information. In this work, we employed the unfolding software MAXED. For a detailed description of the method, readers are referred to Reginatto (2010), as including an extensive explanation here would detract from the focus of the chapter. We term it a "procedure" because we have developed code that automates the unfolding process.

RC: ***Line 233: Weird to read here: "The objective of this study is twofold . . . "***

AR: Will be rephrased.

References

Reginatto, M.: Overview of spectral unfolding techniques and uncertainty estimation, Radiation Measurements, 45, 1323–1329, 10.5194/essd-2025-546https://doi.org/10.1016/j.radmeas.2010.06.016, pROCEEDINGS OF THE 11TH SYMPOSIUM ON NEUTRON AND ION DOSIMETRY, 2010.

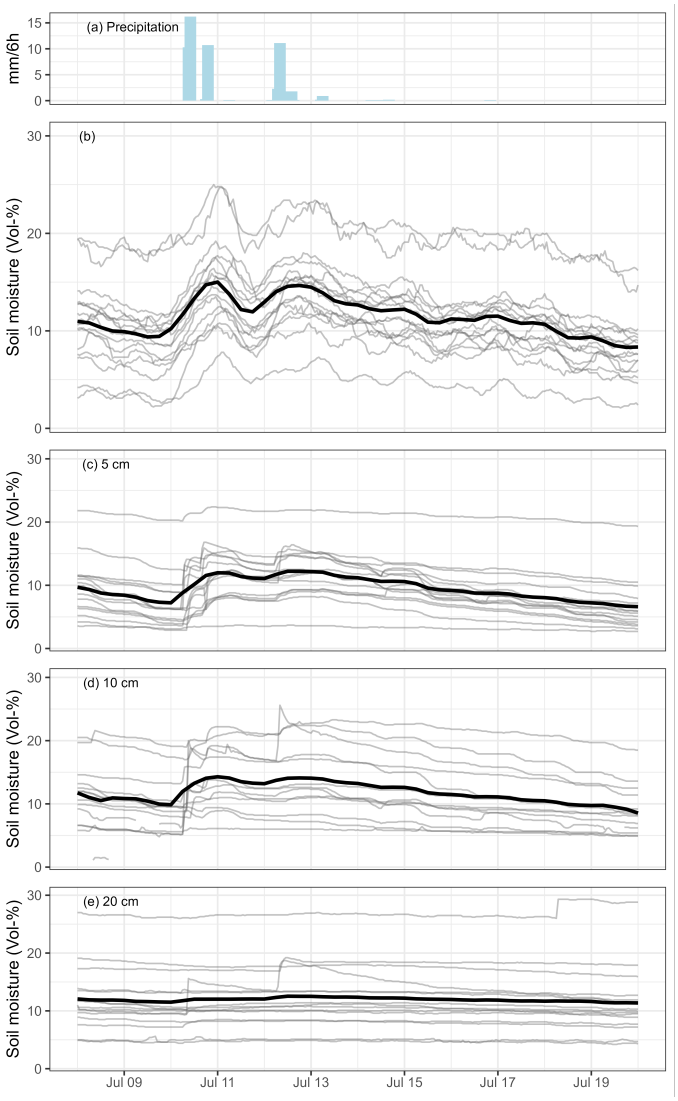

Figure 1: Short time series from 2024 showing precipitation (a), CRNS-derived soil moisture (b), and point-scale soil moisture measurements at 5, 10, and 20 cm depth (c, d, e). Grey lines indicate individual measurement locations, and the black line shows the average.