

Interactive Discussion: Author Response to Referee #2

Soil moisture observation in a forested headwater catchment: combining a dense cosmic-ray neutron sensor network with roving and hydrogravimetry at the TERENO site Wüstebach

Maik Heistermann et al.

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

Dear Referee,

we would like to thank you very much for your willingness to review this paper, and for your positive and constructive response to the manuscript and the data set.

Please find our responses to your comments below.

Kind regards,
Maik Heistermann
(on behalf of the author team)

Specific comments

RC: *L19 – suggest “...limited, particularly when small scale variability is high.”*

AR: Thanks for the suggestion. Maybe we can even shorten this sentence further so it becomes:

"The spatial representativeness of conventional point-based soil moisture measurements is often limited by high small-scale variability [...]"

RC: *L23 – replace “confronted” with “limited by”*

AR: Will be implemented accordingly.

RC: *L32 – suggest “... 100-150 m with a vertical depth...”*

AR: Will be implemented accordingly.

RC: *L39 – suggest replacing “soon enough” with “More recently”*

AR: As a response to a comment by referee 1, we suggest the following:

"Soon after the feasibility of soil moisture observation with stationary CRNS had been demonstrated, a mobile CRNS sensor ("CRNS roving") was established [...]"

We prefer to keep "soon" instead of "more recently" because [Desilets et al., 2010] already published the first proof-of-concept for CRNS roving two years after [Zreda et al., 2008]. To clarify this, we will add the reference "[Desilets et al., 2010]" after this sentence.

RC: *L83 – fix “between 10 and 170 m”*

AR: Will be fixed.

RC: *L105 – suggest “It is available via EUDAT (see Heistermann et al., 2021a).”*

AR: Will be implemented accordingly.

RC: *L113 – suggest “was required to;” then remove “to” from the start of each point*

AR: Will be implemented accordingly.

RC: *Figure 2 – would fit better after dot point rather than within*

AR: We agree. However, figure positioning will be entirely revised during type setting / copy editing with a two column format, so we'd prefer not to interfere at this point.

RC: *Table 1 – would fit better after the dot points rather than within*

AR: Please see our response to the previous comment.

RC: *L350 – 2nd sentence makes no sense*

AR: We will fix the error, so the sentence(s) will read:

"The age structure of the forest is rather homogeneous as it was planted around 1946 after comprehensive clearances. Hence the spatial heterogeneity of the forest biomass is low in comparison to more structured and diverse forests [...]"

RC: *L412 and L413 – I am not sure exemplary is a good word to use. Do you just mean an example of data usage?*

AR: We agree that "exemplary" is not ideal. It was meant in terms of "non-exhaustive" / "by-example". We were not aware of the meaning of "exemplary" in the sense of "best practice". We hence suggest to

- change the header of section 5 (l. 412) to "Examples of cross-scale soil moisture patterns in space and time"
- change l. 413 to "[...] we will provide selected examples to convey an idea of spatial and temporal soil moisture patterns as well as of differences between sensors at different horizontal and vertical scales."

RC: *Figure 6 caption – suggest “flights” rather than “rides”*

AR: Will be changed accordingly.

RC: *L524 change to “... B2HANDLE allow users to share ...”*

AR: Will be changed accordingly.

References

[Desilets et al., 2010] Desilets, D., Zreda, M., and Ferré, T. P. A. (2010). Nature’s neutron probe: Land surface hydrology at an elusive scale with cosmic rays. *Water Resources Research*, 46:W11505.

[Zreda et al., 2008] Zreda, M., Desilets, D., Ferré, T. P. A., and Scott, R. L. (2008). Measuring soil moisture content non-invasively at intermediate spatial scale using cosmic-ray neutrons. *Geophysical Research Letters*, 35(21):L21402, 1–5.