

Comment Part 1/2: Sensor standardization, calibration, and sensitivity

Anonymous Referee #2

Referee comment on "Spatio-temporal soil moisture retrieval at the catchment scale using a dense network of cosmic-ray neutron sensors" by Maik Heistermann et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-25-RC2>, 2021

(I apologize for the late post. I will try to post the second part in 1 day, which is about the spatial patterns and interpolation)

1. GENERAL COMMENTS

This paper presents valuable and interesting results on a dense network of CRNS with an attempt at a uniform calibration for multiple probes. It provides both practical advice and technical insights for the calibration and application of CRNS. Overall, the authors did a great job on experiment design, data collection and analyses, simulation, and result illustration.

2. SPECIFIC COMMENTS

2.1 Sensitivity factor was assumed to be a constant for each sensor, which seems intuitively reasonable but needs scrutiny.

Since these factors are essential to the uniform calibration, it at least requires some citations and/or explanation.

2.2 Please define/specify "local uncertainty". I think the "local" refers to the parameter space, not the spatial-temporal space. If I am correct, it creates some ambiguity in the text since the discussions are always related to space/time in this paper. (Line 271, 415, 665, etc.)

2.3 Please briefly explain the choice of "200 times" of the Monte-Carlo simulation on the sensitivity of N_0 . To my understanding, the number of simulations depends on the dimensions of the parameter space. Why are 200 times good enough to quantify the uncertainty of N_0 concerning these many parameters and disturbances.

3. TECHNICAL COMMENTS

Line 26 "small spatial measurement support" and Line 330 "points of support" Support is an important concept in defining spatial scales of soil sampling and measurements. I recommend adding a definition and citations here. This would also help to present the results on soil moisture spatial patterns in the following sections.

Line 259 "assuming a spatially uniform value of N_0 ..."

Modification required. Since N_0 mainly depends on the sensor itself after correcting all factors (air pressure, vegetation, lattice water, etc.), it is not a spatial variable.

(To be continued.)