

# ***Interactive comment on “Improving Calibration and Validation of Cosmic-Ray Neutron Sensors in the Light of Spatial Sensitivity – Theory and Evidence” by Martin Schrön et al.***

## **Anonymous Referee #1**

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This is a very interesting and fundamental important study, for improving calibration and validation of Cosmic-Ray Neutron Sensors, which is able to bridge the scale gap between point data and satellite products. Although with great interests to go through the manuscript, I found the current presentations of the method, data and results are not clear enough, and therefore, are raising confusions. It is recommended to consider the major comments as following, as well as the detailed comments as embedded in the attached pdf.

Major concern:

1. The author claimed that the revised weighting approach has the potential to reveal otherwise invisible hydrological features, like water ponding in remote or local areas,

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water in the biomass or litter layer, interception water storage, groundwater rise etc. On the other hand, such claim is based on a simplified interpretation by using a lump-sum expression of “excess water storage” in Figure 8. This renders the statement on a weak ground. Unless there are other experimental results or numerical simulation results can provide further proofs for this statement, I am not convinced with this statement by only looking at Figure 8. Furthermore, the area difference between the “CRNS fit” and “revised” curve has two parts: one part is above the “revised” curve, and was defined as “excess water storage”; the other part is below the “revised” curve. However, for this “below part” there is no any explanation.

2. It is very confusing when the authors mentioned “theoretical line” “conventional” “revised”, “equal”. To my understanding, the “theoretical line” refers to the Equation (1), and the  $N_0$  is determined by using the standard sampling scheme as defined by Hydroinnova-soil (e.g. Desilets et al. 2010). For the standard sampling scheme, the equal weighting is deployed for horizontal and vertical samples. Then, how to distinguish this “theoretical line” with “equal” approach? Please help to make all implications for different approaches more explicitly. It is recommended to use same symbols for same physical quantities, while using different sub/super-scripts to represent different weighting schemes. Please see my detailed comments in the attached PDF. It is also recommended to list all different methods into a summary table, which will help readers to understand the topic easier than the currently presented.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/hess-2017-148/hess-2017-148-RC1-supplement.pdf>

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