Reviewer #2:

We thank reviewer #2 for taking the time to review our manuscript. In the following section we will reply to all comments of reviewer #2 with R2-1 (i.e. reviewer 2, comment 1) and A2-1 (i.e. author response to R2-1), respectively.

R2-1: It would be good to see the estimated soil moistures from above ground CRNS in Figure 10. How different the values measured by above ground CRNS and downhole CRNS at 100 m depth?

A2-1: We agree that a comparison with the soil moisture time series derived from above-ground CRNS would be interesting. For the sake of readability of Figure 10, we prefer adding the following additional figure to the appendix of the manuscript showing the soil moisture time series derived from above-ground CRNS as well as from downhole CRNS in 100 cm depth and 200 cm depth:

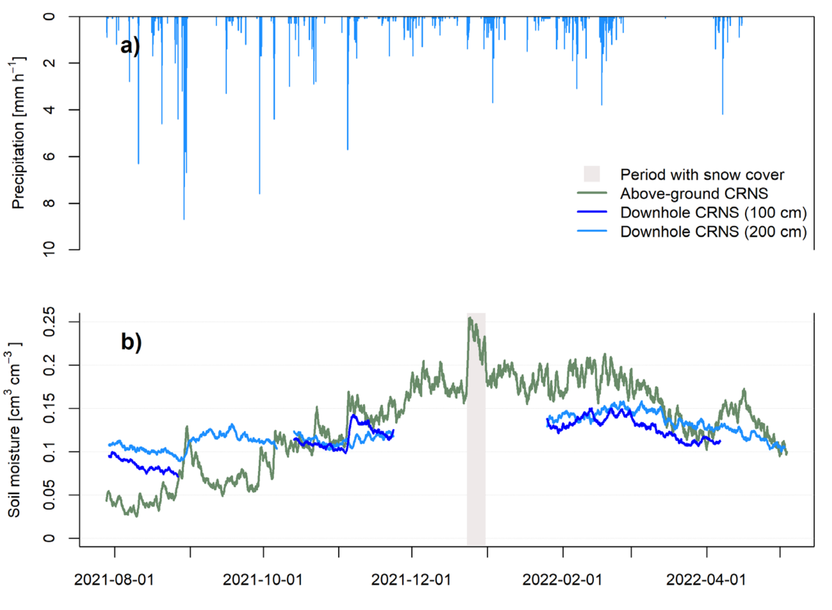

Fig. X: Rainfall time series (a) and the different soil moisture time series derived from CRNS (b). The neutron observations from above-ground CRNS was processed with standard correction and calibration procedures (site Serrahn, Bogena et al. 2022). A 25h-moving average was applied to the corrected neutron intensities prior to deriving soil moisture from above-ground CRNS observations with the standard transfer function (Desilets et al. 2010, Köhli et al. 2021).

R2-2: Is the precipitation in liquid form during the winter? Does snow affect the downhole neutron intensities?

A2-2: This is an important point and we are glad that the reviewer mentioned this aspect as this is not included in the manuscript yet. We will correct this in the revised manuscript. At our study site, most precipitation in winter occurs as rain and only rarely do we have a thin snow cover for a few days.

In general, liquid precipitation is assumed to infiltrate directly and then influences downhole neutron intensities as an increase in soil moisture by its contribution to shielding depth, i.e. the total amount of mass above the downhole neutron detector. This is described by equation 9.

Like any other mass above the neutron detector, a snow cover also contributes to shielding depth and is not considered in equation 9 yet. Consequently, we will change the term describing above-ground wet biomass D_{AGB} to D_{AGM} now describing all additional above-ground mass on top the soil including above-ground wet biomass and the water equivalent of a snow cover in g cm^{-2}. The description in the text will be adjusted accordingly.

As stated in the manuscript, average soil moisture changes from the surface to the depth of measurement through their contribution to shielding depth are much less influential on downhole neutron intensities than soil moisture changes in the depth of measurement. Thus, small amounts of snow are likely to have a rather negligible effect on downhole neutron intensities. In contrast, at study sites with thick snow covers a distinct effect can be expected.