Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2022-211

Anonymous Referee #2

Referee comment on "Impact of topography on in situ soil wetness measurements for regional landslide early warning – a case study from the Swiss Alpine Foreland" by Adrian Wicki et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-211-RC2, 2022

The manuscript presents a very interesting study on the impact of the topography on in situ soil moisture measurements for regional landslide early warning. The study is well organised and provides a very good overview of the literature. Apart from the analysis and discussion in general, the particularly valuable part of the study is the 3 years of data collected for the specific site and weather conditions, which can be very useful to investigate and understand phenomena other than those considered in the study, and this is something that adds value to the manuscript as well. In general, I think the authors are doing an excellent job in improving our knowledge of rainfall-triggered shallow landslides, and I would like to thank them for their efforts and congratulate them on a very interesting submission.
I would have just a few suggestions that I think could be useful in improving the presentation, and also some points that I would like the authors to explain in more detail. Of course, authors are asked to make changes to the manuscript as necessary when addressing these points.

Line 57: In addition to hydrostatic conditions, changes in pore water pressure can also result from the deformations of the slope (interaction pore water - soil structure). Please discuss this point in relation to the pressure potential in general and also in relation to the case study at hand.

Line 71: For certain (coarse-grained) soil textures, residual soil moisture conditions can already be reached at several kPa of matric suction, so this statement may be too general. Please elaborate on this point.

Line 99: It seems that the word "monitoring" might be missing in the sentence. Please check the sentence and change it if necessary.

Line 110 (but also relates to lines 142 and 163): This is perhaps the most important limitation in the study and I believe that this point requires appropriate attention - it appears that there are differences in the soils at the two monitored sites and that the differences in soil texture may alter the retention and permeability properties of the soil and affect the measured values to a greater extent than anticipated. Please comment on this point. In this context, please indicate whether hydromechanical characterisation of the soils (e.g. soil-water retention curve, field or laboratory measurements of hydraulic conductivity) has been carried out or whether only the properties given in Table 2 have been determined. It might also be useful to provide a graphical representation of the granulometric composition of the soil with depth for both sites to provide a clearer picture of the materials involved in the study.

Line 166: It would be very helpful if you could provide more details about the installation of the sensors (orientation and location/distance from the excavation), a sketch of the installed sensors and also some photos of when they were installed. Please also discuss how the soil disturbance during the installation of the sensors might have affected the measurements.

Line 169: Please provide the model and manufacturer of the air temperature sensors and precipitation gauges, and include some basic technical specifications, as was the case for the soil moisture and pore water pressure sensors.

Line 178: Please explain in more detail how point (1) of the data quality control was carried out, what the reasons were and also comment on what might have caused such outliers in the collected data (at least in your experience with the sensors used).

Line 182: Please discuss and explain in more detail the problem of solar radiation on the SWP measurements. How does it manifest itself and what was the correction procedure? Please share your valuable experience on how such problems could possibly be eliminated, or include citations or relevant literature if more appropriate, as this issue may be of interest to readers interested in the topic.

Lines 190 to 193 and line 282: Please explain if the occurrence of surface runoff or water accumulation on the soil surface was observed/monitored in the study (visually or by a sensor) or is this point just generally assumed as a possibility in some scenarios?

Line 191: Do the data collected indicate that the soil is affected by hydraulic hysteresis effects? This point seems to have been completely left out of the discussion or literature review - please consider writing a few sentences on this topic as well.

Line 233: It seems that the relative differences in VWC and SWP measurements for the same location and depth (for the same monitored points) are not discussed. Please

address this point as well.

Line 266: Drying of the soil during prolonged periods of increased ET without precipitation could also lead to the formation of desiccation cracks in the soil or detachment of the soil from the sensor shaft or loss of hydraulic contact between sensor and soil. Please indicate if desiccation cracks or problems related to loss of good hydraulic contact between soil and sensor unit were observed during the monitoring period.

Line 274: Given the data redundancy - multiple sensors at a single monitoring point - could these ambiguities be eliminated or at least better understood/explained? Please provide some comments on this point.

Figure 7: It seems that during the dry period (around 20 June 2021) there is a period for the slope when saturation decreases (b) but SWP seems to increase (d) and even reaches positive pwp values. At the same time, precipitation remains absent according to (a). In general, the saturation seems to decrease constantly while the SWP shows a fluctuating behaviour. Please provide an explanation as to what could be the reason for this or an appropriate comment.

Line 437: Is it possible that preferential paths for water flow were created when the sensors were installed? Please provide a comment on this point.

Line 536: One of the important values of this study and the research project in general is the data collected. Will data from all VWC and SWP sensors mentioned in the study be available upon publication?

Finally, I noticed in several places that the citation follows at the start of the following sentence (e.g. lines 23, 29, 32, etc.). Please check the manuscript and make corrections, if necessary.