

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-294

Anonymous Referee #1

Referee comment on "Soil–vegetation–water interactions controlling solute flow and chemical weathering in volcanic ash soils of the high Andes" by Sebastián Páez-Bimos et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-294-RC1>, 2022

In general, I found the paper to be well written and the study well-designed and carried out.

I found – however – some points to be limited that needs to be addressed. First, the research gap was not clarified and the presented hypothesis was already addressed in other studies (see comments below). Some additional explanation on why the approach observation/modeling was used, would help the readers to capture the study design and idea early on in the work. I also found that the modeling was no explained with the necessary detail and should be accompanied by an uncertainty assessment.

Line 50 "the water balance"

L60: what about porosity and soil particle surface area?

The break from L62 to L64 is quite harsh.

L89 and 90: We already know that the hypothesis is true. It has been shown in numerous studies before. The paper would greatly benefit to make the research gap more clear and have the hypothesis and questions clearly linked to that. While the intro gives a good overview of what has been done, the research gap is only vaguely noted "Soil vegetation-water interactions are not fully understood". After that, the authors summarize things that are known, and not what is wrong in our current status quo. Points that are made e.g. in

L116, should be in the introduction. This applies in general for section 2. Points that are made related to the research gap need to move into the intro.

An explanation on the methodological choices would be helpful, which type of measurement supports which question and for what is the modelling needed?

L123-125: not needed/relevant

L215: what are the sensitive parameters? Do you enforce that the relation between k_{sat} from one depth to the other is retained? What parameter ranges were used for the inverse simulation? Why? In general, 3.4. lacks the necessary details to reproduce or understand the simulation setup.

Fig. 3. I guess the horizontal grey bars indicate the boundaries of a horizon. Yet, this needs to be explained in the captions and not left for guessing. CU-UR and TU-UP should also be explained in the caption or written out to make the figure stand-alone from the text.

L309ff. Do the authors have any idea on the general variation of these soil properties beyond the two profiles? I am wondering if the difference is random or if this is really an effect/linked to the vegetation. I understand that the sampling is laborious, but I guess we all know sites where k_{sat} does change by several orders of magnitude on very small spatial differences. Even though I agree that the A horizons of the sites seem to be quite different.

L327: What are the calibrated values and how do they differ between the profiles and to the measured values? What are the "sensitive parameters" (L.215).

L333: I would partly disagree. When you have a KGE of 0.08, you barely explain anything of the observed behavior. So what is the problem? What could be the problem? Preferential flow? Also, a full uncertainty analysis of the simulation should be added rather than 3 simulations in Figure 4. Furthermore, I am having a hard time to distinguish the different lines on the plot.

L521: Replace "The soil hydrology' simulations" by "The simulation of the soil water balance"

L558: Can you estimate the residence time? Or the general difference between your sites?

L585ff. In this section, mostly literature is cited, however it would be more straightforward to argue from your observation rather than relying on a reference. Of course, other work can then be references.