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Hydrology and Earth System Sciences
Discussions

Interactive comment on "True colors – changing perceptions of hydrological processes at a hillslope prone to slide" *by* P. Schneider et al.

Anonymous Referee #1

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Part of the title - "changing perceptions" of hydrological processes at the hillslope, is misleading to my opinion. The paper in general brings known evidence that subsurface flow at the hillslope occurs as shallow lateral flow in topsoil, if deeper layers are exhibiting significantly lower hydraulic conductivity and allow limited preferential vertical percolation in e.g. clay cracks (as heterogeneous hillslope soils are known for). My perception was reassured, not changed by this experiment. I suggest to modify the title regarding this bold message. – comments:

- TDR calibration in clays (G horizons): is it factory (Topp curve) or locally performed? (might be different for clay materials) - NaCl experiment may impair TDR measurement (different calibration in saline soils on top of clays itself) - NaCl could promote shrinking in clays and increase of hydraulic conductivity as compared to distilled water (clay

swelling) (some authors however observe the opposite) - i.e. alteration of vertical/lateral flow exp. in clay cracks in unexpectable manner, that issue should be addressed

- as suggestion for future experiments at this instrumented plot: last two comments would not apply if stable isotopes are applied instead of NaCl and fluorescein (both also prone to adsorption on soil matrix),stable isotope analyzer is available at the workplace of the authors and would support this experiment without any questions posed. Natural water from Lake Zug could be a good tracer itself, if not, certainly enriched with affordable amount of deuterium

- on 8239 authors refer to nonexistent model of Campbell CR100 logger (correct to: Campbell Scientific CR1000)

- for fig. 4 and 5 - unify the date format 03.08.2011 and 6 October 2011 in the caption

- on 8271 - fig. 5 - 3rd graph - sensor W1 exhibits abrupt dropdown and it can be observed as a gentle dip on sensor W5 and W6 as well, that does not seem a natural behaviour of groundwater table, could you explain?

- those two experiments (3.8.11 and 6.10.11) are performed in similar manner in terms of similar rainfall/sprinkling intensity (nearly the same) but quite different response in terms of overland flow - by one order, antecedent moisture is nearly the same, groundwater table is different in "opposite manner", higher overland flow is observed when initial groundwater is lower but rising quicker in October according to figures.

- the second experiment in October (in slightly drier topsoil) is the one with slower rise of moisture (or groundwater table)-according to the text 8243/15 (which seem not to be true if confronted with fig.4 and 5), earlier NaCl application in latter experiment (August after 2hrs, October after that might support the comment of change of hydraulic conductivity of G horizons and changing pattern of overland flow (some of NaCl might be in the profile in October from experiment performed in August) nevertheless 10x higher overland flow intensity seems to hard to believe (check either data for the unit conver-

sion error first) - is this explainable by the 20 mm/h precipitation threshold? (paper suggest saturated hydraulic conductivity of G horizons (soil matrix) as 10e-9 to 10-10 m/s ie 0.0036-0.00036 mm/h), completely of the range of suggested threshold, therefore topsoil and preferential flow in G horizons are the environment/mechanism responsible for the outflow dynamics) as mentioned in the caption on the fig.8. This seems to be crucial mechanism, but no topsoil hydraulic conductivity, porosity and thickness of the topsoil horizon is given in the paper (indirectly and insufficiently mentioned in 8251/5), please provide such information

- one possible effect in October experiment is topsoil air entrapment which would attribute to higher overland flow

- could authors make a summary of total flows-volumes of SSF/SOF and total masses NaCl (conductivity converted) and fluorescein applied and retrieved at the downslope collectors (or observation points presented on fig. 4 and 5) related to total mass applied (absolute or relative numbers) as complementary table to fig. 4 and 5?

- how much natural/artificial precipitation- "soil profile flush" occurred in between the experiments to flush out the August-NaCl/fluorescein prior to October experiment?

- final dye experiment (imaging) contradicts the findings of sprinkling (NaCl/fluorescein) experiment, according to authors at 8245/20-25, suggesting no intensive lateral flow in the subsoil (G horizons) (thus vertical only) flow. Flow at G horizons as suggested from NaCl/fluorescein experiments is present in the form of preferential flow in the clay cracks (small volume, but high water/mass transfer rate in such channels), with minor color staining. I do not see any contradiction here. Based on the images on fig.3 (8267) deeper horizons show non-negligible staining (preferential flow can conduct masses in single percents of the volume/area, smaller than seen in this experiment).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8233, 2013.