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Hydrology and Earth System Sciences Discussions

Interactive comment on "A conceptual model of the hydrological influence of fissures on landslide activity" *by* D. M. Krzeminska et al.

Anonymous Referee #3

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General comments:

The study of preferential flow through macropores in landslides is very interesting and certainly important to bring the understanding of hydrological triggering of landslides forward. There are however a few important points which need to be revised and which might have quite some impact on the model. Also the writing should be improved (see the technical corrections for which I give many directions for the first part of the article, till I decided this is up to author and co-authors to improve the writing). Therefore I would advice a resubmission of the paper after major revisions with then a new review round.

Specific comments:

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- The first equation on page 11047 should in my opinion be: Nfis = Ffis * $\Delta x * \Delta y / (afis * lfis)$, with lfis an average length of the fissures.

- I do not see why the Nfis needs a minimum value of 1, why can decimals not be allowed?

- I do not immediately see how the authors got to Equation 3, but it seems wrong to me too: in case of only one fissure the result would be $\frac{1}{2}$ Lmat =Lmat?

- I think the direction of the cracks should in some way be included as a crack parallel to the slope direction would have a very strong drainage function while a crack perpendicular to the slope direction would have a strong destabilizing on the soil. I can imagine that the fissures in a landslide do have a dominant direction, but I might be wrong here.

- The fissure connectivity part of the paper is confusing: shortly after the equation on page 11050 the authors mention the indirect connectivity via the matrix (i.e. no macropore connectivity). They also state on P 11048 that there is no explicit fissure to fissure groundwater flow. What is it?

- From the results in figure 5 it looks as though connected fissures are connected in downslope direction and do manage to increase water transport to the toe of the landslide but do not drain it, this seems strange to me. Also it seems that on the whole the landslide is wetter in the case of connected macropores. Does a large part of the water leave the simulated area as surface runoff in the other scenarios? I would also expect that the macropores transport water to depth rapidly and destabilize the landslide from underneath, while without macropores the water has to infiltrate and percolate from the topsoil downwards. Therefore information on soil moisture content of the three different layers depending on the macroporosity scenario would be interesting.

Technical corrections:

P11040: L24: delete is P11041: L8: landslides L 23: fissures L24: delete flow (com-

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ment: the water does bypass the bulk of the soil matrix, but where the bulk flow takes place depends on the initial conditions of the soil and characteristics of the event). P11042: L8: should centimetres be millimetres? L21: suggest to change when talking about... to when dead end fissures are present.... P11043: L1: when the percolation exceeds the conductivity of a deeper soil layer..... (comment: the water can pond on a less permeable layer, the layer above does not yet have to be fully saturated) L2-4: it's not really that either there is or there isn't interaction, this is more gradual: there is generally always some interaction, though this can be between minimal and very large interaction. L4-6: I would delete this line as I think it is not completely right, therefore I would just add the reference to Weiler in the first line where you already mention that the initiation can be both at soil surface as well as in a saturated soil layer. L11-14: strange formulation, please rephrase the sentence: the matrix does not consist of blocks which connect the macropores: the matrix is the soil skeleton all around the macropores and there are short stretches of matrix between macropores. How about just deleting "block.....macropores". L15: increases L24: Moreover, constant opening and closing of the apertures in the reworking material makes it even more difficult to monitor and to model the fissure network/ the hydrological influence of these fissures on landslide occurrence. P 11044: L1: landslides L3:proposed L12: phenomenon L19: Blöschl P11045: L2: proposed a conceptual hillslope model that accounts L3: this is a L6: equations L7: processes P11046: L5: what do you mean with near vertical: they are vertical in your model as far as I can see: they do get thinner with depth but there is no change in direction. L11: this is missing a verb I think: ....from the fissure to the matrix can occur over both.... L20: STARWARS L18/19: rewrite sentence, I do not understand what you mean to say. L25: prescribed P11047: L 10: change length to width L11: change contained to surrounded P11048: L2: potentially? P11049: L3: the factor of safety L9: to calculate .... P11050: L3: arbitrarily: I should expect some explanation for the values used here. L13: particularly to fissures

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 11039, 2011.