



EGUsphere, referee comment RC1
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Comment on egusphere-2022-798

Anonymous Referee #1

Referee comment on "Elucidating the role of soil hydraulic properties on aspect-dependent landslide initiation" by Yanglin Guo and Chao Ma, EGU Sphere,
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The paper investigates the question whether land-sliding initiation at slopes is aspect-dependent. The obvious reason for potential differences - the radiation budget - is not discussed explicitly, but resulting processes - differences in plant root strength, the pore water pressure (or larger evapotranspiration at the south-exposed slope) are. The reviewer wants to know what exactly is your definition of north and south facing - which angle ranges (relative to North) is "allowed"? From the GoogleEarth images, there might very well also be west- and east-facing slopes. Were they excluded from the analysis?

The mechanisms leading to landslides are considered to some detail, including pore water dissipation, water storage and drainage, and stability fluctuations. The description of the latter is incomplete; there are equations shown for the "finite slope model" and the "infinite slope stability model", involving many parameters (such as angles) usually not easily to obtain in the field. Were these modelled by Hydrus-1D? How reliable are these estimates? Obviously (Fig. 11), the two F_s (eqs. 8 and 9) are dynamic quantities - which of the variables on the rhs are time-dependent? At least for the finite model, the time dependence seems to be marginal, but the difference in the mean values seems to be huge in comparison (Fig. 11 lower left panel). What is precisely the origin of this discrepancy? The lower right panel shows that for the south-facing slope, the situation is rather similar (very stable values for F_s), whereas for the north-facing, F_s varies a lot. Why is that the case, i.e. what property or variable of eq. 9 is responsible for that? The reviewer disagrees with the statement that (thus) the infinite slope model would better support the observations, since the only rationale for that is by confirming the prejudice that south-facing slopes are more prone to landslides than north-facing ones. This is circular reasoning.

However, the fundamental problem of the paper is that there is only a single site investigated, where landslides have occurred both at north-facing as well as south-facing slopes. The statistics of that particular location shows that more landslides for south-facing slopes have been recorded: 71 versus 20 - this is probably the result of a field

survey in the area, but the time span over which these happen should be mentioned as well, if known. The whole area is densely tree covered, with a larch species dominating. In the GoogleEarth image, it seems that there are a lot of terraces surrounding the local peaks - is that due to management? If so, what was done there? This striking feature is not mentioned in the manuscript but could of course impact on landslide probability (either way).

However, how could an investigation at one particular area say something conclusive about aspect-dependent landslide probabilities in general?

In that regard, the paper seems to be way too ambitious. To do justice to the paper, systematic differences between north- and south-facing slopes are investigated to some detail. The slopes are rather steep but not different between S- and N-slopes (Fig. 3 left panel); grain diameter distributions are rather similar (Fig. 5); the physical properties reveal some differences, in particular for the saturated hydraulic conductivity, which of course can imply different water routing during and after rainfall events. On the other hand, in the unsaturated domain, it is not obvious that there are any differences in the pF curves (Fig. 8); they look strikingly similar for the two slope aspects. The shear tests (Fig. 6), on the other hand, seem to indicate that the two slope types have different pore water pressure behaviour (NB the reviewer wonders what the legend of that figure ("Time (10-sec)") would mean? Do you intend to say that the time axis is in logarithmic units (to base 10)? It doesn't seem to make sense).

However, cause and effect are totally unclear here: are these differences induced by the different aspects, or just geological properties of the area, or random variation due to small sample sizes?

A technical problem is that the language quality has to be improved. There are a non-negligible number of grammar errors and incomplete sentences which inhibits comprehensibility at times. Before resubmission, this issue should be carefully addressed.

Summarizing, the observational investigation for the selected sites is profound, and the processes and phenomena considered are numerous. However, the presentation is incomplete and in part difficult to follow, and most importantly, the conclusions drawn from this small field study seem to be too far-fetched. The paper deserves a major revision.