

Earth Surf. Dynam. Discuss., referee comment RC1
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Comment on esurf-2022-46

Anonymous Referee #1

Referee comment on "Geology and vegetation control landsliding on forest-managed slopes in scarplands" by Daniel Draebing et al., Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2022-46-RC1>, 2022

The authors present an analysis of two primary controls on slope stability in Northern Bavaria, Germany: geology and vegetation. The topic is important to protect life, property and infrastructure locally. The results also present possible contributions to our understanding of slope stability that would be applicable elsewhere.

I have two major comments that I believe will help to improve the paper.

- Motivation/what's new? It is known that slope stability is influenced by both geologic and vegetation controls, the authors could better identify the knowledge gap and clearly illustrate how their study fills this knowledge gap. Specifically, the abstract jumps straight to the actions performed without motivating/asking a clear research question. The introduction only reaches a clear motivation towards the end – focusing on the vegetative controls of landsliding in shallow *and* low angled hillslopes. Is this the key knowledge gap (what controls shallow and deep landsliding on low angle slopes?) This should be made clearer in the abstract/intro to justify the study and used to better explain results in the discussion section.
- Clearly define the two types of landslides and proposed controls. As written, the two types of landslides (deep and shallow) and the specific controls the authors investigate (geologic properties, vegetative root strength, respectively) are not clearly presented.

Whereas some general background is appropriate in the introduction, there should be a sharpening of focus that clearly defines landslides of different depth, and the respective controls investigated in this study. It is initially unclear why the authors investigated tree root strength when the majority of landslides were all deeper than 2 m where no roots were found. The discussion of the tree root data similarly lacks focus and a take-home point because it is not clear why these data are included in the study.

Additionally, there are useful tree data (DBH, age, stand density) that would add to the study.

Specific comments:

Abstract opening sentence is true, but what is knowledge gap paper attempts to fill? Clearly identify two types of landslides (shallow and deep) and the knowledge gaps on what controls these types of landslide on shallow slopes.

10 'rooted area' is supposed to be root area ratio?

14 how do high pore pressures develop due to geologic conditions? Do you mean due to hydrologic conditions? Or increased pore pressure along low permeability boundary?

20 final 1-2 sentences of abstract would be stronger if they followed the 'two types of landslides' outlined above and distinguished how the mechanisms controlling slope stability are different in each (geology – forests)

Intro why does the introduction start with a summary of sedimentary rocks? The paper is focused on geologic/vegetation controls on slope stability and as a reader I expect the principal topic to be one of those listed in the title.

43 Also Schmidt, Roering, Ziemer, Terwilliger & Waldron.

55 also Ziemer (<https://www.fs.usda.gov/treearch/pubs/8693>)

61-62 Ziemer and Terwilliger and Waldron (<https://pubs.geoscienceworld.org/gsa/gsabulletin/article-abstract/103/6/775/182576/Effects-of-root-reinforcement-on-soil-slip>)

40-62 tighten language as there is some repetition

62-67 Good motivation for study – but should also clearly distinguish between shallow and deep and the controls of geology and vegetation. This reasoning should be in abstract

117 cite RMS from previous investigations and briefly summarize what was found

127 dead/cut trees were excluded, but dead/cut trees continue to provide strength until they rot away. See Ziemer:

140 only 1 species (Scots Pine) was measured in this study and roots .

195 should g_s represent the saturated bulk density of the soil?

215 **goal** to 'test if root cohesion would be sufficient to stabilize the soil' of shallow landslides should be mentioned in the introduction.

Fig 2 legend 'transekt' should be 'transect', since Rhätolias-Feuerletten boundary is so important, consider changing color to make it stand out.

Figure 4 explain in legend the criteria used to identify failure plane boundary – I had to go back and search to find line 122 about Figure S3 and the identified shear plane depth

Figure 5 legend should include scarps, caption should tell reader locations of panels a, b, c, referring to the maps in figure 2. Fürstenanger is the only location with a spatial pattern in species – with Scots Pine concentrated near headscarp. Is this important?

293 This sentence is not clear. What does 0.19 refer to?

Figure 6 why do the authors plot root diameter against tensile strength in MPa instead of against tensile force at failure? I recommend including the previously published data to show the stated similarities with other species

317 unclear sentence, instead of stating 'get' unstable, I suggest 'become' unstable or fall below FoS of 1.

Figure 7 why are there no data for 0.5 cm depth in the European Beech? And, are the authors sure there are no roots deeper than 0.5 m that would add tensile strength to the soil?

Fig 8 caption 'We assume an angle of internal friction of 8.4°. **We vary** cohesion between...

334 'All these locations are **underlain** by...'

Figure 9 I like the figure, the different colors are hard to see.

349 sentence structure 'Of the 125 observed landslides, 95% occurred at the R-F boundary...'

360 'In between the lower high-**resistivity** cells...'

362 'The lower part of the landslide was characterized by flat topography, low-**resistivity** areas...'

392 unclear what this sentence is trying to communicate 'Water can move laterally...'

444 what effect might lateral root cohesion have on such a broad landslide?