Earth **Surface**
Dynamics
Discussions

Interactive comment on "Tree-roots control of shallow landslides" *by* Denis Cohen and Massimiliano Schwarz

Anonymous Referee #1

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Synopsis: The paper introduces an innovative numerical model for the simulation of shallow landslides, which specifically accounts for the role of tree roots in slope stability. After a detail and comprehensive description of the model, the results of different trial simulations are presented and discussed, in order to clarify the complex interactions of forces and factors in rooted soils, then emphasizing the potential of the proposed model as a tool for reproducing the triggering of shallow landslides.

General comments: I really appreciate the content of this paper since it focuses on an extremely interesting topic (i.e. the role of tree roots in slope stability) that very few authors have dealt in detail. The manuscript is fairly well written; however, I suggest some modifications in the structure in order to improve the readability of the text. In fact, in its current form, the manuscript is probably a little bit long and in several parts a little wasteful. In detail:

1) The introduction is too dispersive: you should shorten this section by removing the superfluous information and focusing instead on the difficulties concerning the modelling of shallow landslides in rooted soils, then emphasizing how SOSlope is able to overcome these problems. The novelty of your model should be highlighted both in the introduction and in the conclusions of the paper;

2) In my opinion, the model description is over-detailed: considering that the main peculiarity relies on the simulation of the root-soil interaction, you should shorten the description of the hydrological part by referring more clearly to the bibliography;

3) You should clearly distinguish the "results" and "discussions" section, in order to clarify what conclusions can be drawn from the results, then avoiding undue redundancy . This modification is necessary also considering the great amount of data reported in the text. In this respect, on the basis of your conclusions you should also reconsider if all the twenty figures that you have included in the manuscript are required for the comprehension of the text.

As regards SOSlope, considering the results of your simulations it seems to be an extremely useful tool for the simulation of shallow landslides. However, there a few aspects concerning the model which I believe are well worth examining at the end of the "discussions" section. These aspects should be considered as food for thought for future improvements of the model. Specifically:

1) The slip surface is currently predefined by the user. This point should be modified in view of performing provisional analyses: are you planning to modify the model in this sense?

2) Is the model able to account for different infiltration rates by varying the vegetation type?

Specific comments:

p. 4 line 24: are you sure it's "hPa"?

p. 12 line 31: "Than 1" in place of "then 1".

p. 14 line 13. "Eq.33". Maybe it's "Eq. 31".

p. 19 line 15-16. "The extent of cells....... suffer displacement". Please clarify this sentence.

p. 21 line 12: "kN" in place of "kPa".

p. 29 line 5: "configurations".

p. 29 line 7: "factors of safety".

p. 30 lines 20-24: These sentences are not clear. Please rewrite this part.

p. 32 lines 2-3: I think that this sentence is quite superfluous.

p. 32 line 5: Please check the commas. Which is the tree diameter used in these simulations? It is not specified in the text.

p. 32 line 6-7. Again, I think that this sentence is quite superfluous. Please try to shorten this section (4.3.2) since it is quite redundant in a few parts.

p. 33 line 14 and figure 19: why did you decide to show only the 5-mm results? What about the 7 and 8 mm?

p. 37 line 10: "smaller small". Please fix it.

p. 37 line 29: Please check the syntax of this sentence.

Table 3: F0T is repeated twice: please fix it.

Fig. 9: Which is the meaning of those fluctuations for the Safety Factor?

Fig. 13: Again: which is the meaning of those fluctuations for the Safety Factor? From the figure is not clear when the FS goes below 1. Why those two arrows are shown in the figure? The double scale on the two axes is a bit confusing. Why the failure in the 50/10 simulation occurs before the 50/0 one? The latter result is a bit odd and should

be briefly discussed in the text.

Fig. 16: I believe that the zoomed picture is quite useless, also considering that you do not discussed it in the text

Figure 18: Why those two arrows are shown in the figure? The double scale on the two axes is a bit confusing.