

Interactive comment on “Shallow landslides modeling using a particle finite element model with emphasis on landslide evolution” by Liang Wang et al.

Anonymous Referee #2

Received and published: 31 May 2019

The paper addresses the application of a PFEM to the study of landslides. The test cases are well known simple slope examples and a moderate-velocity landslide. Even though the numerical scheme is known and already applied for the study of some landslides, this application for a landslide of slower kinematic back analyzed on an adequate amount of monitoring data may be of interest for the readers.

However, there are some major issues that need to be addressed, I divide them in broad comments and specific comments.

BROAD COMMENTS

In the title and in the paper you refer to “shallow landslides”. A landslide as Ca’ Mengoni
C1

that has a 30 m deep slip surface cannot be defined as shallow by any nomenclature standard. The term shallow should be discarded.

Some specifics about the difference between associated and non-associated and the flow rule should be inserted in the text. ESurf is a journal with broad audience and the basic assumption should be at least briefly stated. Moreover, the soil parameters, the location of the water table, the boundary conditions for all the landslide simulation should be added (maybe in a table). That would help understand better the results and also help ensure reproducibility.

Some performance index about the congruence of your results with the monitoring data like location of the slip surface and velocity of the landslide should also be present. The MI index landslide profile change cannot be the only parameter, in fact from the definition of landslide countermeasure works the proper representation of the location of the slip surface is in a sense more important.

The part about the “weakening process” is not well developed. I would have expected to see the function you use for simulating the weakening process rather than a somewhat vague description in paragraph 4.2.4. The function was calibrated just through back analysis? Was some rheological consideration included in the definition of the weakening function? You show that “it can be done” but your results does not provide a good representation of the process, so you have to explain better why you think that these results are interesting for the scientific community even if the work is still largely in progress.

SPECIFIC COMMENTS: I 21 p 1: rainfall does not affect “material strength”, were you speaking of total stress?

Fig – 8: the figure is already published in another paper (consider copyright issues) – would it be better to modify it a little bit, maybe with the depth of the slip surface for each inclinometer

l 3 p 2: discard gradually

l 10 p 3: discard the before PFEM and FEM

l 15 p 3: mapping.

l 22 p 3: analyze dam stability

l 2 p 4: to prove that our model can be used to assess landslide hazard

l 7 p 8: discard deposited and add stopped/halted

Fig 9: can you please use the same scale for figure 9 as for figure 8? The whole shape of the slope in fig. 9 (and following) is distorted and it is not possible to compare the actual movement with the modelled one.

paragraph 4.2 l 7-11 p 10: The whole paragraph is not clear and needs to be properly re-written. Moreover, discard shallow depth

l 13-15 p 10: Correct from the adopted with using. Moreover, is it correct to say that you identified a slip surface when your FOS is way above 1.5? In fact then you say that you use a factor of 1.5 to reduce the parameters. So the whole first 4 lines of this paragraph need to be edited for clarity and following the proper order.

l 20 p 10: Berti placed the WT at ground level, where did you put it?

paragraph 4.2.1 so for the static analysis the non-associated model does not work properly – you need to discuss this result

paragraph 4.2.2: the 4 set of parameters used to produce the outputs of figure 11 should be summarized in a table, otherwise it is impossible to assess your results.

l15-16 p 11: are the virtual time and the actual time of failure somewhat comparable? what was the actual (target) maximum displacement?

l18 p 11: misfit index (MI)

C3

Fig 12: check the scale distortion

Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2019-17>, 2019.

C4