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Comment on gmd-2021-283

Anonymous Referee #1

Referee comment on "iHydroSlide3D v1.0: an advanced hydrological-geotechnical model for hydrological simulation and three-dimensional landslide prediction" by Guoding Chen et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-283-RC1>, 2022

Review of iHydroSlide3D v1.0: an advanced hydrological-geotechnical model for hydrological simulation and three-dimensional landslide prediction

Overview

The paper presents an algorithm that couples hydrological modelling and 3-D landslide prediction, and gives a good overview of why such a model is needed given what already exists in that field. The introduction provides a good review of the limitations associated with hydrological modelling and landslide prediction separately, and then how these two types of models can be combined to better represent mass movement. The model framework also provides a clear overview of the method and its underpinning equations. I am recommending this paper for publication with minor revisions. These revisions and suggestions for improvement are as follows:

Introduction

- The scientific and technical contribution of the paper and model is clear, but it would be good for the authors to mention the real-world applications of combined hydrological-geotechnical models for land planning and disaster risk management. Although briefly mentioned at the end (P29 L655-656), discussing the importance of this type of model to policy-makers and decision-makers would further underscore its utility.

Model framework

- Section 2.8: this section needs some revision to present what inputs are needed in a more organized manner. The first sentence gives a high-level overview of what inputs datasets are needed, but the section doesn't give a good idea of what other parameters are needed in association with these datasets. P13 L337-338 then says that hydrological parameters are needed, but with only one example. Later in Section 3 (P14 L370), it says that information about the impervious surface area was calculated from the land cover map. This section would be more useful if it put the required underlying data and parameters up front. The following table is just a suggestion as a starting point:

Input	Datasets	Derived datasets/parameters
Topographic	Digital elevation model	Flow direction
		Flow accumulation
		Topographic wetness index
Land cover	Land surface cover	Percentage impervious area
Soil	Soil texture	Saturated hydraulic conductivity
		Available water capacity
		Exponent of the infiltration curve

Results and discussion

- Like the introduction section, it will be good to have more discussion about how the model framework can contribute to land management and disaster risk management.
 - P29 L655-656 says: "*The produced zones of risk and landslide geometric properties are valuable for disaster prevention and risk management.*"
 - Can you give some examples of how you see the model framework and code being used in these situations? Would they be used for climate change scenarios? Would they be used for real-time modelling? Would the risk zones be used as guidelines for no-build areas?

Specific comments

- P3 L90: "physically-based"?
- P4 L100-101: Add access dates to URLs
- P10 L276: Why is the minimum value of *FS* and *PF* assigned to the cell?
- P11 L280: What is meant by "sufficiently large number of ellipsoids" and how is that determined? P16 Table 3 talks about the parameter set based on landslide inventory, but how is that calculated?
- P11 Figure 4: The white letters and numbers are hard to see, would recommend a black outline to make them stand out.
- P14 L375: Please give an idea of how much time was needed, either for each module (hydrological and geotechnical) or total runtime to get the user an idea of computational efficiency.
- P16 Table 3: Although defaults are recommended later in the text, it would be good to give some ranges/ballpark figures for *Ncores*, *Landslide Density*, *TotalTile*.
- P21 Figure 9: It is difficult to see the orange landslide circles, would recommend maybe black outline hollow circles instead of orange outline.
- P22 Figure 10: Are these the same four moments as in Figure 9? I would recommend putting the timestamps here too.
- P26 Figure 13: It is hard to see the orange circles again, and they may blend in with the orange colours in the legend. Would again recommend black outline hollow circles.
- P29 L596: What was the computational time required and what is considered "acceptable"?

Code testing

I tested the code available on Zenodo. The included manual is great to show a step-by-step of what needs to be done. It was relatively easy to get it up and running, but I ran into some errors in MATLAB because I had not installed some toolboxes (e.g. Mapping Toolbox, Parallel Computing Toolbox, Curve Fitting Toolbox). It would be good if the manual included the list of Toolbox dependencies in case the user has a limited installation of MATLAB.

Once the Toolboxes were installed, I was able to run the code without errors. I wasn't sure how to interpret the datasets in the Results section, and it would be good if the manual could give a brief rundown on what the results represent. The accompanying text files

(*Outlet_Results*, *Outpix_03501000_Results*, *Outpix_03501000_Results_Statistics*) were also empty.