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## **Comment on nhess-2021-74**

Roberto J. Marin (Referee)

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Referee comment on "Debris flow event on Osorno volcano, Chile, during summer 2017: new interpretations for chain processes in the southern Andes" by Ivo Janos Fustos-Toribio et al., Nat. Hazards Earth Syst. Sci. Discuss.,  
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The authors studied a "relevant" volcanic debris-flow event that occurred in Chile and combined field work analysis with numerical modeling to present relevant information about these phenomena. The research study is valuable for the scientific community. Minor errors should be corrected and some modifications to the conclusions and introduction are suggested as follows (I'm sorry to combine small corrections with suggestions and questions indistinctly):

The English is good but some specific parts have errors that need to be corrected (I addressed some of them but I am not a native English speaker).

### **Abstract**

The abstract is comprehensive and appropriate for the paper.  
\*I suggest to remove the word "Finally" at the end of the abstract.

### **Introduction**

I think the description of the volcanic flow-type landslides in the Andes is very interesting. Probably mentions of the numerical modeling of debris flows in the scientific literature should be included.

Line 38. "Nevertheless, debris flows in volcanic zones have not been evaluated in detail" I think this phrase is too risky. You can only say that it requires more investigation or not many research studies have been carried out...

Lines 39-40. "The present work evaluates the generation of debris flows, taking the 2017

Petrohué event as a case study. This event caused severe economic losses to one of the most popular tourist attractions in southern Chile (INE, 2018)."  
Not too common but I think it is ok to read this starting the introduction.

The objective is relevant and it was clearly stated. Probably it's a bit general.

Figure 1. It is difficult to read the text of the figure. Maybe the font size is too small or probably it is solved easily increasing the size of the figure.

Line 114. I suggest to mention Figure 2 better (in the text).

"Different soil deposits allowed understood the mobilization features, checking if it corresponds to a non-Newtonian flow."  
I suggest to rewrite this sentence.

"Liberation zones close to the Volcano summit, were physical weathering of the lava flow deposits exposed by pluvial erosion was assessed in the field."  
And to check (and correct) this one.

"in the follow numerical model."

...

"The estimated values of the cohesion and internal friction angle was integrated into a database to be used during the back analysis phase"  
...were integrated

Line 153. The first time you mention "SERNAGEOMIN" you should specify what it is.

Line 160. "If we take the  $\eta$  correspond to the fluid viscosity with isotropic stress distribution."  
Please rewrite it clearer.

"Table 2 Model parameters used in r.avaflow."  
A space is missing. Correct the word "used." Why is there an asterisk (\*) in the internal friction angle?

Line 168. "parameters presenting serious discrepancies were..."

What do you mean serious discrepancies? Is it discrepancies between the simulations and the real event? Or measurements?

Line 170. Do you consider a 30-m spatial resolution is appropriate for the modeling? Now, I think that if the reason for the selection of the spatial resolution is the availability or considerable computing efforts it should be stated in the paper.

Line 184. "Surface representation"

Good, partially answering my previous questions.

Line 205. "These which favours a faster movement, increasing lateral erosion according to field results"

Please rewrite if it can be clearer.

Figure 4 is referenced before Figure 3.

Line 233. "allowed understood"

Probably misspelled.

Line 234. "(iError! No se encuentra el origen de la referencia)"

Figure 5. "Volumen"

Volume.

Figure 6. "Escarp". "Error backanalysis".

Scarp.

## Results

I think the results presented are relevant to the scientific community. I wonder if the authors consider that figures including more modeling results were not so relevant. In my opinion, since different scenarios, projections and zones were modeled, more maps of the debris flows would be interesting. Probably to include it (I suppose the journal have this option) as supplementary material if the authors justify that they were not so relevant for the paper.

I'm not sure if it was specified how the error calculation was done.

"DEM SRTM (...) DEM ASTER concentrated a larger part of the material towards the north"  
Not clear for me.

I consider many figures (e.g. 5-7) should be referenced better if divided to Figure 7a, b, c...

Lines 315-320. It is good for my previous comment about the DEM resolutions.

"Finally, water-rich mass flows are distinguished by material type, water content, the presence of excess pore pressure, or liquefaction at the source (Calhoun & Clague, 2018)."

This phrase is repeated in lines 337 and 349. Then, both paragraphs have the same contents. Probably you were supposed to remove one of them.

Not clear about "best modelled scenario" and "worse scenario for...".

#### Conclusions

I suggest to shorten the first three paragraphs of the conclusions. A summary may be acceptable but I consider it is not necessary to present results to conclude about them (at least taking so many long phrases).

The last conclusion is very accurate.