

Review to the paper

## **Sensitivity and identifiability of rheological parameters in debris flow modeling**

Submitted to NHESS by *Gerardo Zegers* et al.

Reviewer: *Martin Mergili*

The authors investigate on the sensitivity of debris flow simulation results to the model parameters used by the FLO-2D software. Two debris flows in northern Chile are employed as case studies. Some of the key findings of the study are that there is some redundancy of information, that there is a certain degree of equifinality, hampering the identification of “correct” model parameter sets, and there is a broad spectrum of levels of sensitivity among the different model parameters with regard to the various reference parameters.

This paper covers a highly relevant topic which is certainly within the scope of NHESS. It is generally well-written, concise, and appropriately illustrated. Reference to the relevant sources is given. Before publication, I recommend some optimization, mainly concerning the precision of some formulations and statements and comparison of the results with other studies. In summary, I recommend **minor-moderate revisions**.

### **General comment**

What would be interesting to see is a little bit more of discussion on how the findings of the study (e.g. the patterns shown in Fig. 4 and Fig. 5) relate to previous work. Do the results confirm earlier studies, or are there some contradictions? If yes, how could they be explained?

### **Specific comments**

Section 3.1: some of the references are formatted in a strange way

L143:  $V$  is used here for volume, but before was is used for velocity - using  $Vol_T$  instead of  $V_T$  would be more consistent. The same applies to  $V_{Test}$  introduced in L149.

L146: "or non-flow condition": please explain more clearly how this relates to SD.

L172ff: If Zegers (2017) has successfully simulated an event through calibrating the parameters with this same event, this is NOT a validation. It would only be a validation if the calibrated parameters are then applied to another event. Please clarify.

Fig. 1: Nice figure, but two remarks: (i) The lines in the overview pane leading to the detailed map of La Mesilla should pass behind the legend, and not in front of it. Further, it would look better if the lower line for La Mesilla would start at the southern end of the deposit. (ii) The threshold values in the legends are ambiguous:  $>0-1$  m;  $>1-2$  m etc. would be correct.

Fig. 3: Please revise caption (some issues of grammar).

This is all from my side. If the authors disagree with the one or the other comment, or would like to discuss issues, they should feel free to contact me at [martin.mergili@univie.ac.at](mailto:martin.mergili@univie.ac.at).

With best regards, Martin Mergili