

## ***Interactive comment on “Study on the combined threshold for gully-type debris flow early warning” by Jian Huang et al.***

**Jian Huang et al.**

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Received and published: 23 November 2018

Nov. 22, 2018

Re: nhess-2018-241 Dear reviewer, With this letter, we are submitting the revised version of the captioned manuscript. All comments from the reviewer have been well addressed. Details are given in the attached response.

The co-authors really appreciate the invaluable comments and do believe that the manuscript has been greatly improved accordingly.

Thank you very much for reviewing.

Best wishes, Jian Huang Manuscript: nhess-2018-241 Title: Study on the combined

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threshold for gully-type debris flow early warning Authors: Jian HUANG, T.W.J. van Asch, Changming WANG, Qiao LI

Revision - reviewer' response Summary of the paper: Huang et al. (2018) explored the combination thresholds (pore pressure and rainfall) for gully-type debris flow in Wenjia gully, China. A three-level early warning system is presented and applicable to the real-time debris flow warning. The topic is certainly of interest for the readership of Natural Hazards. However, the overall quality of the manuscript is poor in presentation. The main problem is the lack of a clear discussion of the contribution of this work. Answer: Thanks. All the comments have been considered and revised in the revision.

Detailed Comments: 1. The Introduction section is not well organized, which makes readers confused about the real relevant background information and its relationship to your topics. Answer: The introduction of this manuscript has been reorganized in the revision to make it clearer for the readers. 2. Table1: What is the time period of the accumulated precipitation? The conclusion that the number of debris flows decreases with time is hard to read from the table. Instead, a figure of trend line will be better. Answer: The definition of the accumulated precipitation has been added in the revision. Please refer to Lines: 150-152. The trend figure has been added as well, please refer to the figure 5 in the revision. 3. Some contents of Section 3.1 and Section 3.2 are unlikely to belong to Methodology, they are more like data sources and results, and should be re-organized.. Answer: The section 3.1 and 3.2 have been reorganized in the revision. 4. In Fig 7, it is not convincing that only one record exceeds the threshold, besides, is the location of the debris flow matched with SY01? It is necessary to specify the locations of debris flow events and monitoring sensors. How about other two debris flow events that have detailed records (you mentioned there are three debris flow events with detailed pore pressure monitoring data). Answer: The one record of pore pressure presented in Fig.9 to show that the changes of pore pressure can be regarded as a factor for forecasting debris flow occurrence. And after this rainfall event, when we came to the field for investigation.

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It's very difficult to ensure the accurate location where the debris flow started. But at the location of SY01, we can make sure that the thickness of deposited material has been changed by the debris flow. The other two debris flow events are discussed below following the presented method. Field monitoring data is difficult to obtain, and the debris flow events are not easy as well. Based on such condition, the presented method can be thought as a preliminary result for this research stage. With more data collected in the future, the combined threshold still can be revised by the foundation methodology. 5. In Fig 8, as only several rainfall events are used to validate the proposed results, the readers will seriously doubt these statistical-based conclusions. Answer: After installing the monitoring sensors, more than five years have passed. There are only three debris flows which have been captured by the monitoring system. With more data collected in the future, we do believe that the presented method would be more seriously for the readers. 6. Line 229-236: 8 rectangular points with debris flow means the rainfall event with debris flow, should the magenta points also belong to this group? And the blue points also belong to the triangle group? It is confused. Why there is only 5 points? only 5 rainfall events have the pore pressure information? The analysis of Fig 8 is not clear enough to obtain the final conclusion (the rainfall threshold and pore pressure threshold need to be combined) and needs to be improved. Answer: In fig. 10, the magenta points and blue points indeed exceeded the rainfall threshold, but there was no debris flow occurrence. Therefore, it proved that the rainfall threshold can not be referred as the only index for predicting debris flow. The pore pressure in the deposited material might be a more important index. So, we combined them together to show a combination analysis for debris flow early warning. The only 5 triangle points of rainfall amount are history events in the study area, which exceeded the rainfall threshold, but there is still no debris flow. All these information show that rainfall threshold is not enough for the gully-type debris flow forecasting. 7. Line 263-266: it would be better to show the changes of rainfall and pore pressures for the two rainstorms in 2014 you mentioned, like the small circular magenta solid points in Fig 9. Answer: Fig. 11 (Fig.9 before) shows how to use this presented method for

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gully-type debris flow early warning in a real-time way. Therefore, only one case has been analyzed in this figure, and the other two cases in 2014 has been listed in Table 1, and illustrated in the conclusion section by a short discussion. For readers, we think it's better to be clear and simple to use this provided method in practice. While more valid data collected in the future, more deep analysis work will be done to complement this methodology for gully-type debris flow early warning.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-241/nhess-2018-241-AC3-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2018-241>, 2018.

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