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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Large Scale Physical Modelling Study of a Flexible Barrier under the Impact of Granular Flows" *by* Dao-Yuan Tan et al.

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1. Page 5: value of 2.0 proposed by Wendeler in 2008: PHD Thesis ETH No 17916

Reply: Thanks for your correction, we have corrected this citation error in Line 117 and Table 3.

2. Page 7: velocity of the flow only calculated by the high speed videos? Very roughly, no laser devices in front of the barrier?

Reply: The velocity of the granular flow was measured from continuous photographs taken by the side-view high-speed camera. To reduce the measuring error, the impact velocity of the granular flow is calculated from the average value of the velocities of 5 particles measured from 5 continuous photographs before the impact with the as-

sistance of the reference lines attached to the flume. We agree that more measuring devices will increase the accuracy of measurement.

3. Page 8: 5 m/s can be for granular flow in the correct range but I am wondering about bulk density given with 1600 kg/m3 fitting not in the range of granular flow which normally have around 2000 kg/m3 (page 22) and more.

Reply: We agree that the typical bulk density of granular flows is around 2000 kg/m3, but the testing material in our study is dry aggregate, which has a lower bulk density.

4. Page 10: Second surge not realisitc for reality, because the material was already drained. How long was the time in between the two surges? In a real debris flow it happen all together very quickly, there is no time of drainage

Reply: The time interval between two tests is around 2 weeks, because we need at least 2 weeks to prepare a test. We agree that the drainage of the debris deposition should be considered in the study of multiple debris flows. In our study, the research subject is dry granular flow. Thus, drainage should not be a problem.

5. Page 12, line 279 it is Figure 12 instead of Figure 10.

Reply: Thanks for your correction, we have corrected it in the manuscript.

6. Page 16: Two tests is nothing for research background and statistic interpretation. You need more tests to interprete the results correctly. Second test is not useful because front was stopped, no dynamic impact onto the barrier.

Reply: We agree that more tests can enhance the reliability of the quantitative conclusions drawn in this study, but it is difficult to perform more tests in a short period due to the long preparation time of a large-scale test. The granular flow in Test 2 was stopped before it can reach the flexible barrier due to the poor fluidity of dry granular flows, but it still can provide valuable data in the study of the motion and the deposition of the second surge in a multiple granular flow event.

7. Page 17: explain and discuss the results together with table 3 page 24. It must be more clearly explained where the results come from.

Reply: Thanks for your comments. With the conclusions drawn from Table 3, it can be preliminarily concluded that the impact force on the flexible ring net and on the supporting structures should be estimated separately using different simple approaches. Thus, the design of a flexible barrier for debris flow mitigation can be optimized by dimensioning and designing the flexible ring net and the supporting structures individually with appropriate design loadings, which provides a safer and more economical design method. A specified explanation has been added into the manuscript (Line 415 to 418). We have corrected the citation error of the hydro-dynamic approach with the dynamic coefficient of 2.0 in Table 3.

8. Page 17: I still believe that c=2.0 is representing the granular impact on flexible barriers but we need more test results.

Reply: We agree that the hydro-dynamic approach with the dynamic coefficient of 2.0 can correctly represent the impact of a granular flow on the flexible barrier based on the comparisons in our study. More tests are under consideration to further verify the coefficients in simple approaches in the future research.

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