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Natural Hazards and Earth System Sciences Discussions
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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. How did the authors define the word large-scale in their experiments?

Reply: The definition of large-scale in our tests (Polyu model) is based on the definition of the large-scale physical model built by USGS (Iverson et al. 2010; Iverson 2015). The physical model built in Polyu site has similar dimensional parameters to the USGS debris-flow flume. Specifically, the capacity of testing material is 4.3 m3 in Polyu model compared to 10 m3 in USGS flume, and the width of the flume is 1.5 m in Polyu model compared to 2 m in USGS flume. Even though the length of the flume in Polyu model is much shorter than the length of USGS flume (7 m compared to 95 m), the flume in Polyu model is sufficient to generate granular flows with dynamic parameters similar to

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real cases and debris flows in other large-scale tests. In the generated granular flow, the flow velocity (5 m/s), the measured impact force (10.96 kN) and the deposition mechanism are similar to the parameters of debris flows in literature (Bugnion and Wendeler 2010; Arattano and Marchi 2005). Thus, we regard Polyu model as a large-scale physical model.

2. In lines195-197, how did the authors define the deposition height of the granular flow, and the maximum horizontal deformation of the flexible barrier? It is better to show them in the scratch.

Reply: Thanks for the comments, we have added the definitions of the deposition height and the maximum horizontal deformation of the flexible barrier in Fig. 6 in the manuscript. A soft copy is attached in the following Fig. 1 in the reply.

3. What are the unique advantages of the experiments performed in this paper compared to the other researches, as the authors stated that an improved large-scale physical modelling facility for debris flow research has been conducted?

Reply: The description of the improved large-scale physical model used in our study is to emphasize that the physical modelling device is improved by a novel door opening system (see Page 6, Line 141-142). With the novel door opening system, the door can be flipped up quickly after triggering to minimize the interference from the door and increase the uniformity of the generated granular flows. Besides, a new measurement method is utilized to directly measure the impact forces on the flexible ring net (Section 4.1), which is another advantage of the experiments in this paper.

4. How many Test1 and Test2 experiments were performed by the authors? It would be great if the authors can comment how the experimental results vary between different rounds of experiments.

Reply: Thanks for the comments, we only did once for each test. We will consider conducting more tests in the future. However, it is difficult to perform more tests in a short period due to the long preparation time of each test.

5. In Table 1, how did the authors determine the internal friction angle and the interface friction angle for granular flows?

Reply: The internal friction angle of the aggregates, which is regarded having the same value with the angle of repose (Hutter and Koch 1991), is measured by the pouring test introduced by Miura et al. (1997) and Zhou et al. (2014). The interface friction angle is determined by the tilting plane method introduced by Hutter and Koch (1991) and Zhou et al. (2014). The above description has been added in the manuscript (Page 7-8, Line 177-180).

6. In the 4th column of Table 3, the unit kN should not be italic.

Reply: Noted with thanks, we have corrected it in the manuscript.

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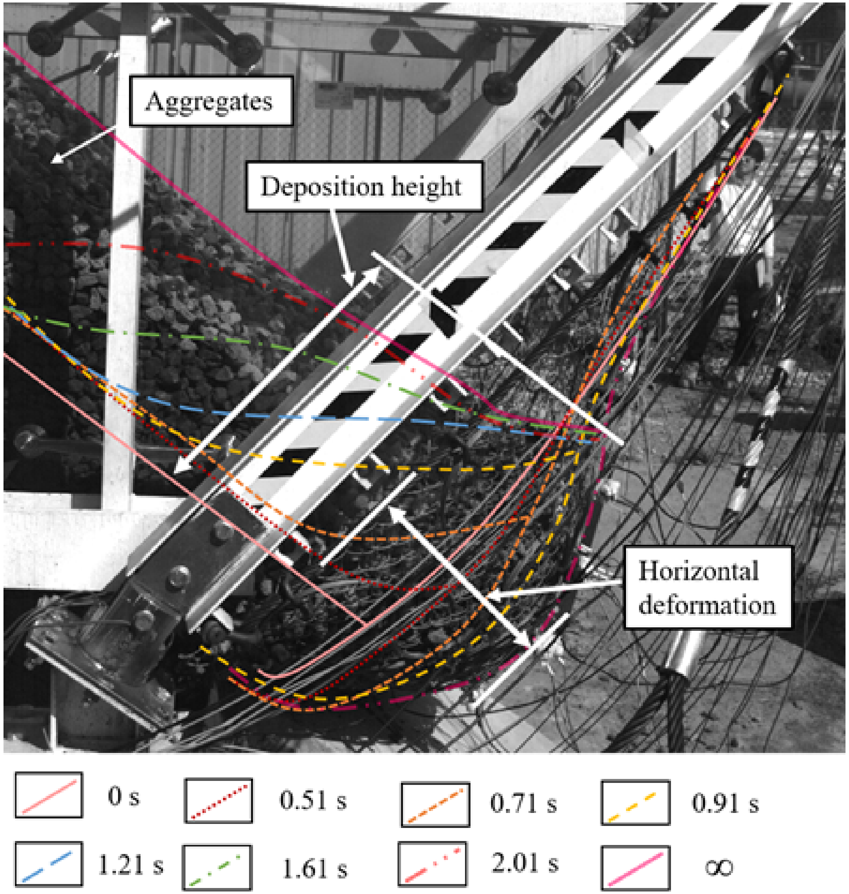

Fig. 1. Side profiles of deposited aggregates at different times in Test 1 (Fig.6)

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