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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "The Potential of Smartstone Probes in Landslide Experiments: How to Read Motion Data" *by* Bastian Dost et al.

Anonymous Referee #1

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Please find a review of the manuscript titled "The Potential of Smartstone Probes in Landslide Experiments: How to Read Motion Data", submitted by Dost et al. to NHESS. The authors present the use of "Smartstones", pebbles equipped with motion probe, to characterize motion features of single clasts within artiïňĄcial laboratory-scale landslides. The authors well present the literature of landslides and specifically in the lab, and they identified the missing part, of describing the motions modes of single clasts during the landslides. I think that they present a promising branch of the research of landslides, thus, I recommend on accepting the paper, but I also have some major comments and thus recommend on major revisions, and then consider acceptance.

As an NHESS paper, I would expect a more rigorous explanation of the experimental scaling to landslides. I understand that the main goal is to proof the concept of the

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Discussion paper

Smartstones method, however it is placed in a lab simulation of landslide. Moreover, the paper is structured as a laboratory experiment of landslide, including the reasoning in the introduction, and a very detailed description of the transport of the gravels, and the different modes of their motion. Thus I think that the reasoning of the specific experimental setup should be explained. Also, upscaling considerations to the larger scale, real world, landslides should be discussed including scaling analysis, as is expected from physical experiments.

I suggest to send the manuscript to grammatical editing. Also some typos should be cleaned from the manuscript.

Repetitions between figure captions and main text – unneeded redundancy.

Add a bit more about the implication of this method in the Abstract

L11 – mention the size\type of pebbles is more interesting then the entire mass.

L79 – what is the former version? – maybe I missed.„

L124 – needed?

L105 - The sampling rate (100 Hz) is low. Most probably, it cannot record the sharp impulse during a collision with another rigid body. Miss recording such impulse can lead to significant errors in the velocity and position, calculated by integrating the recorded acceleration. The authors should address this issue, provide an estimate of a typical collision duration in their experiment, and show that it is longer than 1/sampling rate. In case the above condition is not fulfilled in the experiment, the authors should explain the implications. A short discussion on the sampling rate in a broader context of a real landslide can be illuminating for the reader.

L133 - It appears that the system of coordinate of the ACC is not following the convention of the "Right-hand rule". Can the authors comment on that. In any case this is an important information for the reader.

L137 - 1. The term "higher-order" may not be the best choice as the position of a body/point is always relative. 2. The "real" axis system is not suitable for comparison of different probes; the "flume" system suit this purpose; this is why the authors used it for the graph in Figure 6 that compares the movements of different probes.

L223 – Can you clarify 0.0 g means?

L225 – The whole section (3.1) is very long and tedious. The formulas are trivial, in any case, the authors do not use the projections of g in the discussion.

L432 –the end of the sentence is missing.

L437-442 - The most probable reason for the wrong trajectory of pebble 3 is miss recording of collision with another pebble due to the slow sampling rate of the used IMU.

L446-447 This statement does not fit the description of the behavior of one body, out of many, in a multi-body system where collisions between bodies redistribute the energy of the system in a random way.

L472-473 – Too much details.

L510 - In the present study, the probe monitored movements over a short period of$\sim$ 2 sec. A brief discussion regarding the expected error in retrieving the trajectory over more extended periods can help to assess the type and scale of landslides that can be monitored in this way.

Figure 3 – change the axis title to the same side.

Figure 5a,c – add the flume reference as well.

Fig 6 - color coding has a few cycles so it is not injective and a bit hard to follow, maybe add time stamps at the end of each cycle?

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