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Earth Surface Dynamics Discussions

Interactive comment on "3-D models and structural analysis of analogue rock avalanche deposits: a kinematic analysis of the propagation mechanism" *by* C. Longchamp et al.

Anonymous Referee #2

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The subject of the physical modeling of granular flows for a better understanding of the flow evolution, mobility and deposition mode is interesting even if not all the processes involved can be realistically modeled at the lab scale. At the same time this approach is not novel and many approaches have been tested and presented in the literature for different slope conditions, geometries, scales, material properties and data acquisition. This study is not fully innovative from most of these aspects but deserve some attention mainly because of some of the adopted / developed approaches. My main observations can be summarized as follow: - Introduction is quite broad but relatively limited in the presentation of similar modeling approaches. A slightly more complete and updated review could result in a more useful or general overview. The description

of large scale features in real landslides could be useful but it is not a primary point to consider. - Data acquisition: probably this paragraph could be titled Methods or experimental methods - I am not sure which kind of material has been adopted but probably carborundum (not carborandum) or silicon carbide. This is a particular material characterized by high density and very low friction. This is a major point that would be useful to evaluate because there is no description of the material properties, both in terms of internal friction angle and of basal friction angle/coefficient. As a consequence, the interpretation and possible reuse of the experimental data by other researchers would require a basic characterization or at least the reporting of literature or technical data - Dimensional analysis could be named or considered even if most of the scaling laws and dimensionless number have been already reported in the literature. Some mention or value could be given or simply report the variables values so to allow for a computation of the numbers. - The problem of the electrostatic effects could be relevant considered the extremely small mass/volume of material adopted in the tests. A more specific description of carborundum is required also on this basis. - For the colored granular material and for a better understanding of the possible processes and structures, it would be useful to know the material properties of the colored sands at least to evaluate the differences and for possible use by other researchers. - Study of the effects of roughness is an interesting aspect of this research. At the same time it is not common to compare this to realistic conditions where usually roughness is not a fixed bed condition. In fact, most of the times the basal surface is naturally rough but is also erodible (I.e. not fixed) - Fixing slope angle to 40° is reasonable but at the same time neglect to study the relevance of slope angle in controlling flow evolution and deposition. - The relevance for counting the number of colored grains within a specific area should be explained more - Methods: again, the type of system adopted for the acquisition should be better detailed. For example, the number of fps for the high speed camera, or the resolution and precision of the laser scanner. - Sfm is introduced in quite a general way but then is dismissed by simply saying that is not relevant because does not work with this kind of material. So there is no mean at introducing

it. Light scattering at the grain surface could also be a problem with laser scanning and so this could be mentioned or at least it should be said if really important considering the scale of the problem. This point is partially tackled but not clearly stated. - Gradient operator filtering: not novel per se, but anyway it is found useful to the aim of the study and helps in a clearer definition of the structures. - Visual inspection: I have to admit that from the figures the internal structures are extremely difficult to be seen and recognized. At the same time, the authors should describe a little bit more the role or effects of different materials, of the friction characteristics of the involved materials - High speed videos: the general quality of the images is low and this could be simply a problem of the uploaded file resolution. Nevertheless, apart for the colors the general evolution is poorly constrained. The reason for passing from carborundum to sand should also explained atleast to clarify the possible effects. For example, why in this case there is no attention to the electrostatic effects named at the beginning for the adoption of carborundum? - Frank slide: probably is too much to introduce the Frank slide example as it is in the manuscript, considering the length of the description (just a few lines). - Discussion: there is some interpretation in terms of time for the formation of the internal features. It should be clear that there is no real observation in time for the formation of the internal features. So talking about a possible order of formation is at least improper. The same could be said about the significance of these features about the flow mobility - In the description of flow and formation of structures I think it should be carefully considered how a flow in extensional regime could be at the same time exerting a compressional action. In a certain way this seems not possible unless a clearer explanation is given (see e.g. step 6 in the sequence). - The effect of the layering (transversal to the release geometry should be mentioned - As said above the internal structures do not seem to be so clearly recognizable. Furthermore, if the material in the tail is slower and much slower than the frontal part it is unclear how the pushing action is occurring - The various steps are in a certain way re-expressed in the successive list of points when internal structures are described - Point 1 in the discussion: the velocity at the front is assumed similar to the one at the back: is this possible

or realistic considering that thickness is different , no pressure contribution is present and that the tail motion is lasting more? - It is said that it is possible to understand now why the structures are not randomly distributed. Actually, no one ever said that they are or should be randomly distributed, on the opposite it is clear that there is a reason for the general disposition and order of formation - Referencing: I suggest to complete a search for granular flow modeling considering some interesting laboratory results about the propagation along slopes, on hard or soft layers with different characteristics and the description of internal structures or formation of lateral levees as delimited by sort of strike slip features. Some other piece of research describes the evolution in time of granular flows during their motion and deposition. Since older works from Gray to more recent ones. An interesting one has been published by Rowley et al., 2001 and more in recent papers.

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