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Interactive comment on "Combined effects of grain size, flow volume and channel width on geophysical flow mobility: 3-D discrete element modeling of dry and dense flows of angular rock fragments" *by* Bruno Cagnoli and Antonio Piersanti

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This study investigated the impact of several factors on mobility of granular flow, which is a hot topic in mobility of rock avalanche. Several new findings were obtained through numerical simulations and physical simulations previously conducted by authors. However, there are still some questions needing authors to answer or revise. (1) Lines 20-21, Page 4: When I first read granular flow mass in this paper, many questions arose in my mind included: What does this mean? How to determine it? Why the authors

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use all those masses in the simulation? Why do not the authors use particle number or other parameters to quantify of total particles used in simulation? I understood until I finished reading the paper. Could authors please simply explain those questions when it first appears? (2) How to determine the properties between particles, particles and channels, particle and gates in this paper? When we do numerical simulation using discrete element method, one of the most important procedures is to determine the micro-parameters of and between elements. In this research, the authors directly gave the parameters without explanation. (3) This research used centre of mass of deposit to calculate the mobility of granular flow in the numerical and physical simulations. However, it is very difficult to determine the centre of deposit, especially in physical simulation and in granular deposits of a real rock avalanche. Could the authors please explain how to determine centre of the deposit in their physical simulations? (4) Page 9, Lines 23∼25: "The collapse along a single straight line of all the data points of the simulations with $\theta = 27^{\circ}$ confirms that, in Figs. 9 and 10, only the variables considered in Eq. (19) have values that vary and, consequently, determine the observed different mobility of the centre of mass of the different flows." âŚă Not only the variables considered in the equation (19) determine the mobility of granular flow, many other variables not considered also have influence, which were actually the constant in this research. âŚą About angle of sidewall, the authors only used 19 ° and 41 °, which is too few to find the fitness. Furthermore, they did not try to fit the three data points with width of 6 mm and three different angles of 19 °, 27 ° and 41 °. Therefore, it is not reasonable to exclude angle of sidewall as a factor affecting the mobility. (5) Page 10, Lines 25∼ 28: Authors should add the latest research "Zhang, M., Yin, Y., McSaveney, M. (2016) Dynamics of the 2008 earthquake-triggered Wenjiagou Creek rock avalanche, Qingping, Sichuan, China ", which also drew the conclusion the mobility of granular flow increases with finer grain size. (6) About impact of the volume of granular flow on mobility, the conclusion in this research is much different from our generally accepted one that mobility increases with increased volume of the granular flow. Even if this research used centre of the deposit to calculate the u/l, the conclusion is different from

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the research conducted by several scientists on mobility of rock avalanches (Davies et al., 1999). (7) About impact of channel width, the conclusion in this research is contrary to the statistic results on rock avalanches conducted by Nicoletti and Sorriso-valvo (1991). (8) The authors did not consider grain fragmentation during movement in their physical numerical simulations, which plays a very important role in the mobility of granular mobility. Actually, many scientists (Davies and McSaveney, 2009; De Blasio and Crosta, 2014, 2015) reached the conclusion that physical simulation cannot repeat the high mobility of granular debris flow because it is not able to simulate the pervasive grain fragmentation during movement. Could the authors please explain the reason and the impact that the grain fragmentation was not considered in this research? Another two corrections: (1) Caption of Fig. 9. Delete "The alues in millimetres are the channel widths w and the values in degrees are the sidewall inclinations θ". (2) Caption of Fig. 10. Delete "The alues in millimetres are the channel widths w and the values in degrees are the sidewall inclinations θ".

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