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Discussions

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Interactive comment

Interactive comment on "Tangjiaxi Landslide and Impulse Wave Analysis in Zhexi Reservoir of China by Granular Flow Coupling Model" *by* Bolin Huang et al.

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The authors appreciate the positive comments from reviewer 1#, thank you for your good suggestion and comments, which make the MS better! Below is the response point to point:

1. Landslide moved velocity is very important to impulse wave, and the parameters for numerical simulation dominate the results right or not. What are the parameters for calculating the landslide moving velocity, and how to determine them? What about the parameters for ïňĆuid? Response: The dynamic of landslide is very important to the formation of the impulse wave. The granular flow coupling model calculate the movement of landslide mainly by the equations of granular flow (Mih, 1999) and other

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general equations, such as mass continuity equation, momentum equation and energy equations, and so on. Therefore, the special control equation is the equations of granular flow, the parameters controlled the dynamic of landslide are grain density, grain diameter, and grain restitution coefficient, and so on, which can be seen in Table 1. The fluid is mainly controlled by viscosity of fluid, as it is water, a Newtonian fluid. The parameters of density, average diameter and initial porosity of rock grains were determined through field survey and laboratory tests. The grain restitution coefficient in the first phase is obtained by back analysis or trial calculation, which is 0.2. In the former MS, we do not tell how the restitution coefficient is determined, we added it in Page 11 L16-18, as following: "After trial calculation, 0.2 was taken in the first phase when the impact mainly occurred among grains, which makes the simulation results more realistic."

2. The run-up of the wave is shown in Fig.8. Please introduce the methods to obtain the heights of wave and the wave kind. Response: It is easy to obtain these data in Euler method, as the code is Euler algorithm. We record the hydraulic data history of certain positons, for example the free water surface elevation, we can read the water elevation of every positons history along time went. Therefore, the height of wave, the wave kind or the run-up is obtained. In the former MS, we do not tell the code is Euler algorithm, we add this information in the MS in Line15of Page 12, as following: "With the finite element/volume method with Euler algorithm adopted".

3. The landslide dam shape formed in the numerical simulation is different from the actual situation (Page 13, Line 12) in Fig. 12 and Fig.13. Is it the main reason that the spherical solid gains with similar grain size? How about the inïňĆuence of soil or rock parameters? Or the parameters in the manuscript were not reasonable? Response: Yes, the landslide dam shape formed in the numerical simulation is different from the actual situation in Fig. 12 and Fig.13. We think that the presumption of the spherical solid gains with similar grain size is the main influence factor. Let us suppose that some viscos fluid slide along a plane, they always deposit as a fan. As long as we adopt this

presumption, the shape will not change fundamentally, regardless of the parameters of rock and soil. The parameters of rock may change the position of deposit, but the sharp will still like a fan. But if there are some impurity or grain in this fluid, the sharp of deposit may changes. I hope I have explain what we think about the different about the deposit sharps clearly.

4. The results in Table 2 have some differences between investigation and calculation. What are the reasons? Further discussions should be added to the results in the manuscript. Response: Yes, the simulating values and investigation values are not exactly the same. Thanks for your suggestion, we add a paragraph to discuss the reason and show the possible solution in the future for this numerical method, which is as following: "The equations of Baglad and Mih were obtained from the experiments of sphere grains, and there is non-coherence among the grains. Although some parameters are taken by back analysis in the case, the dynamic capacity of sphere grains is bigger than grains with other sharp, which make the energy transferred to water higher. Meanwhile, in the actual situation, rock mass slides into water along with disintegrated. In the dynamic process, there should considerate general coherence to reflect these forces. Therefore, the run-up values simulated are larger than investigations in generally. Consideration of coherence and sharp of grain is a main modification direction for this granular flow coupling model, which might improve its realism for a wider range of applications."

5. There are some spell mistakes in the manuscript, i.e. in Fig.1 the Tangyangguang landslide or Tangyanguan landslide. ResponseïijŽYes, it should be Tangyanguang. Thank you for your careful review, I modified the picture as following, and the MS will keep changes synchronized.

Meanwhile, there are also some mistakes in the former MS, I have modified it; for example, "asl." is not consistent in the former MS, we modified it.

Please also note the supplement to this comment:

http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-332/nhess-2016-332-AC1-supplement.pdf

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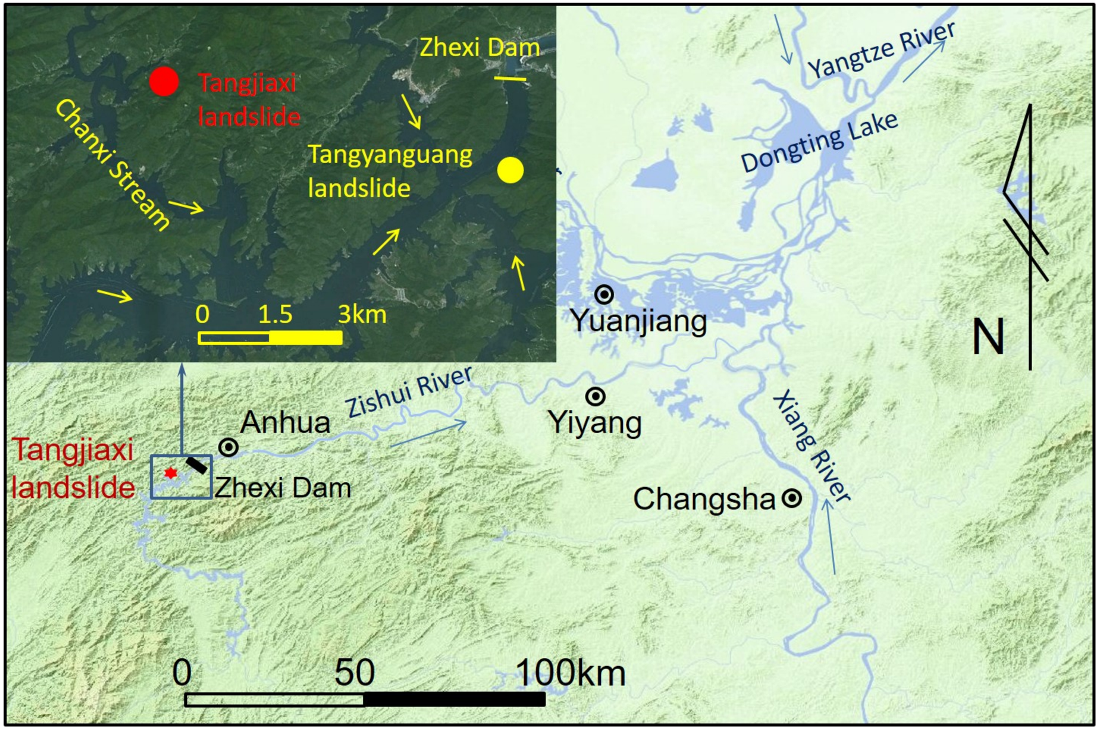

Fig. 1. Fig. 1 The location of Tangjiaxi landslide in the Zhexi reservoir, Hunan Province, China

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