

## ***Interactive comment on “The catastrophic landfill flowslide at Hongao dumpsite on December 20, 2015 in Shenzhen, China” by Qiang Xu et al.***

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The authors would like to express gratitude to the comments from Dr. W.P. Wang. However, it appears that the reviewer read the original version of the manuscript, whereas a rather extensive revision has been made and a revised manuscript was submitted on 13 Sept, 2016 (nhess-2016-196-manuscript-revised-2). Please see the responses to the comments below (we have made some references to the revised manuscript for the questions that are referred to the original manuscript and already addressed in the revised one).

1. The volume of the deposit and the landfill should be checked carefully again. The maximum design capacity should be 4 million m<sup>3</sup>, so the numbers in the text should be also checked carefully. The authors cross-checked with the official incident report

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released after the submission of this article, the design capacity was, indeed, 4 million m<sup>3</sup>. It has been revised.

2. Please give the method to estimate the permeability of waste filling. The infiltration rate of the waste filling was estimated by using field double ring infiltrometer. It has been added.

3. Please note that Fig.4 is not cited in the text. Fig. 4 is cited in the Line 101 in the revised manuscript (nhess-2016-196-manuscript-revised-2).

4. In Fig.5, daily rainfall data could be better to explain the failure process. A heavy rainfall with an amount of 67.8 mm occurred on December 9, 2015, only 11 days before landslide. The authors were reluctant to emphasize this particular rainfall event while the rainfall data is already presented to the reader, as it implies somewhat a direct correlation between the failure and the rainfall event (which there may possibly be) wherein we have insufficient evidence to proof that. The heavy rainfall event is now added in the paper.

5. In Tab.3, If we add the flowslide volume at A and B areas, the total volume is only 4.66 million m<sup>3</sup>, so the number should be checked. Volume of area A in Table 3 is the mobilized volume in the dumpsite (Line 196 in nhess-2016-196-manuscript-revised-2). It has been revised to avoid confusion.

6. What's the meaning of fill zone in Figs 14 and 18? It indicates the remaining of the dumpsite – it has been updated.

7. Please note that Fig.22 is not cited in the text. Fig.22 is no longer included in the manuscript.

8. In the 6th section 'Laboratory Experiment', the location and characteristics of the 4 samples should be made clear. Sampling locations are added in the manuscript.

9. In Fig.25, please add the method to determinate the groundwater level. A hypothetic groundwater level is not appropriate enough for FOS calculation. This section has been

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extensively revised. The hypothetical groundwater level is indeed not ideal for a FoS calculation, but it is sufficient to demonstrate the back-calculating the FoS by using LEM with the hypothetical groundwater level 'at failure' and the sliding surface in zone A is not suitable because the failure mechanism of this flowslide appears to be complex and numerically challenging to model. Please see the further response to comment #10.

10. In Tab.4, There is a big difference of the 'of waste surface between the laboratory and inversion analysis, so it is necessary to explain the reason of using' =9.4. If it is just used for reducing the FOS, the value should be discussed. This section has been extensively revised. Its purpose is to demonstrate that back-analyses using LEB is not applicable to the flowslide, as the failure may involve liquefaction with subsequent progressive failure and post-failure propagation. In the back-analyses, we set the FoS to unity to back-calculate the mobilized strength at failure which yielded an unreasonably low friction angle of 9.4 (as compared to the experimental finding of 31.9). This is due to the inappropriate use of the static pre-shearing pore-water pressures with post-liquefaction failure surface. And the results of the numerical analysis demonstrated such inapplicability of using the conventional limit equilibrium method to analysis the propagation of diffuse failure.

11. In Fig.26, the vertical coordinate head should be added. It has been added in the manuscript.

12. Please add the reference "Mechanism of the December 2015 Catastrophic Landslide at the Shenzhen Landfill and Controlling Geotechnical Risks of Urbanization". It has been added.

13. Many spelling and grammar errors. It has been revised.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-196/nhess-2016-196->

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