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Discussions

Interactive comment on "An improved method of Newmark analysis for mapping hazards of coseismic landslides" *by* Mingdong Zang et al.

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Thank you very much for your kind and constructive suggestions in such detail. And we deeply appreciate your fairly good patience, the time and energy devoted for reviewing our manuscript. We have modified the manuscript following your kind comments one by one.

Q1: A general effort of editing should be carried out to clarify some passages and improve the readability of the manuscript. On the enclosed copy, I marked statements that need to be corrected and/or rephrased, reporting some suggestions, for which, however, the authors should verify that correctly reflect what they meant. R1: We have modified the manuscript following your kind comments one by one, see Line 19, 44,

50, 78-80, 82-85, 142-144, 149-150, 152, 157-159, 161, 170, 172, 174, 181, 185-188, 192-193, 196-197, 199, 204, 206, 218, 221, 223, 254, 259, 265-266, 278, 280-298, 302, 308, 310-319, 323, 326, 334, 521-522, 541-542 and 574-577 in the revision.

Q2: The geological setting of the study area seems to be too poorly illustrated: an at least schematic map of the study area geology should be provided. R2: Yes, we have added a geologic map of the study area showing lithology and faults, see Line 83 in the revision.

Q3: With regard to the statements of lines 156-159, it is unclear to me why an angle of 45° + 1/2 of friction angle was assumed as representative of sliding surface inclination on slopes where DEM provides angle greater than 60°. Clarification would be desirable. R3: According to Jibson et al. (1998, 2000), slopes steeper than 60° remained unstable, even at rather high strengths. We think that this is because Newmark's rigid-plastic block is not suitable for such steep sliding surface. In this case, the sliding would occur along a plane with an angle of 45° + 1/2 of friction angle to the horizon. We have added a Figure to make it clear, see Line 159 in the revision.

Q4: At lines 197-199, the authors declare that the critical acceleration was found to reach, in the study area, a maximum of 14 g in areas of lower susceptibility. This maximum seems to me meaningless for the context of a dynamic slope stability analysis. It could be reported that the areas with lower susceptibility are those with critical acceleration greater than 1 g. R4: Changes were made in the revision, see Line 196 in the revision.

Q5: At lines 262-263, the authors state that "most of the actual triggered landslides lie in the higher confidence-level areas with CF values greater than 0.60". It would be desirable to have a more quantitative information at this regard: what is the percentage of such landslides? R5: The quantitative portion of the actual triggered landslides lie in the higher confidence-level areas with CF values greater than 0.60 is 73.2%. Changes were made in the revision, see Line 259 in the revision.

Q6: In my opinion, Fig. 15 is poorly significant. The certainty factor CF and the proportion p(H/E) occupied by landslides within areas falling in Newmark Displacement bins are two quantities uniquely related to each other, once the “a priori” probability p(H) is fixed, through the equations (9) and the corresponding inverse functions reported on Fig. 15. Thus, the perfect fitting of black dots along the red curve depends merely by the fact that the black dots are randomly selected samples of the red curve itself. More significant would be to show how CF values are related to the Newmark Displacement values Dn, as Jibson et al. (2000) did for the proportion of landslide cells, corresponding to what is here defined p(H/E), plotted versus Dn. In that study, it was this relation that was modelled through a Weibull curve, whose coefficients were derived by regression (see Fig. 14 of the cited paper). A similar plotting of CF as function of Dn would make possible to evaluate the consistency between these two quantities. Thus, one could obtain hazard estimates also for a seismic scenario different from the one used in the present study, once, following the same procedure described here, the Dn values expected for the new scenario is calculated. R6: We consider your suggestion seriously and modify the manuscript depicted as follows: (1) for the statistical significance of the function between CF and Newmark displacement. The predicted displacement cells were grouped into bins based on quantile statistics. The break points are 0, 10, 30, 39, 46, 51, 55, 59, 63 and 122 respectively. In this way, the number of cells in each bin is equal; (2) As the range of CF-values is from -1 to 1, not 0 to 1, Weibull (1939) curve developed by Jaeger and Cook (1969) is unsuitable here. Therefore, we modified the functional form to CF=2m[1-exp(-aDˆb)]ˆ-1, where CF is the certainty factor, m is the maximum CF-value represented by the data, D is predicated displacement, and a and b are regression constants. In each bin, the CF-value of Newmark displacement was plotted as a dot. The regression curve based on data from the Ludian earthquake is CF=1.837[1-exp(-0.073Dˆ0.821)]ˆ-1; (3) The value of CF increase monotonically with increasing Newmark displacement. We could obtain hazard estimates different from the one used in the present study through following the same procedure described here. Changes were made in the revision, see Line

280-298.

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