

Title: Characteristics of landslides in unwelded pyroclastic flow deposits, Japan

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General Comments

The manuscript describes an investigation about the relationship between rainfall characteristics and landslide occurrence in an area of southern Kyushu Island in Japan characterized by the presence of unwelded pyroclastic flow deposits resting on steep slopes. The authors investigated 184 landslides and the related rainfall events trying to individuate a correlation between the storm characteristics (in terms of rain intensity and duration), the antecedent precipitations (in terms of antecedent 7-days, API_7 , and 30-days, API_{30} , cumulated rainfall heights) and the occurrence of different types of landslides in Shirasu deposits. The research is interesting, the paper is concise and well written and should eventually be published even though, I think that the following main shortcomings should be addressed.

- 1) The manuscript gives few information about the study area such as size domain, elevation map, vegetation, characteristics of the covers, etc etc
- 2) For sake of simplicity the authors have classified the various types of landslides occurred in the area into two main groups (slab-type and deep planar failures), associating to each of them a well identified triggering mechanism. Although the first mechanism, related to the increase of the unit soil weight and the reduction of the apparent cohesion due to the decrease of suction during water infiltration is clearly stated, the second one, related to a pore water pressure development in the soil cover, is not so clearly clarified. Are the Authors referring to the development of perched water tables, water inflow from preferential paths, rise in the water table? In this regard, some information are given in the section "Summary and conclusions": it should be better to anticipate them in section 2.
- 3) The soil properties of the Shirasu deposits are not well described and, since the literature which the authors have reported is mostly in Japanese, the interested reader cannot easily find them. Moreover, it seems that only one type of soil is involved in the landslide phenomena. Adding information in this regards should be very useful for better understanding of the triggering mechanisms. As an example, the evaluation of safety factors presented in section 3.3 shows that for both the cases of steep slopes (40°) and very steep slopes (72°), failure happens when soil reaches saturation. However since the soil has a saturated friction angle of 32° (lower than the gradient of the slope), the cover remains stable up to saturation only if the soil also has effective cohesion. But it is not clearly addressed in the text. Please, comment on.

Specific comments

Section 2

The authors have detailed information about the localization of the landslides which should be shown on the map in Figure 1. Moreover, the map should be modified in order to show a Digital Elevation Model and the position of the geological section illustrated in Figure 2.

Page 5, line 32. Please, clarify the triggering mechanism associated to the deep landslides. Have you some information on the position of the ground water table?

Page 6, line 23. Please, clarify that the API values obtained subtracting the mean evapotranspiration rate will be indicated as “adjusted API” values in the following sections.

Section 3

See point 3 in General Comments.

Add a table with the main physical and mechanical properties of the soil and, likely, their variability in the investigated area.

Page 8, lines 21-24. The values of FS indicated in the text are not equal to those illustrated in Figure 6. Please, check.

Technical comments

Use the same symbolism for the units and refer to the SI units throughout the manuscript.

Figure 6. Modify the caption deleting the soil characteristics and inserting them in a Table.