



Landslide occurrence frequencies and susceptibility assessment, Machu Picchu, Peru

Jan Klimes (1), Paola Reichenbach (2), and Mauro Rossi (2)

(1) IRSM CAS, IG, Prague, Czech Republic (jklimes@centrum.cz), (2) CNR – IRPI, Via della Madonna Alta 126, Perugia, 06128, Italy (Paola.Reichenbach@irpi.cnr.it, Mauro.Rossi@irpi.cnr.it)

A multi-temporal landslide inventory map has been prepared for the slopes around the UNESCO cultural world heritage site of Machu Picchu using different set of aerial photographs, satellite images and field surveys. The inventory map has been exploited to evaluate landslide susceptibility and to characterize the landslide temporal occurrence. Temporal analysis shows how the spatial landslide frequency may be affected by the length of the period covered by the inventory maps. Inventory maps prepared for short intervals or for single landslide events represent mainly a “snap shot” of the landslide activity in the study region and may therefore provide partly misleading information with respect to the future scenarios, in fact low landslide frequency areas may exhibit different higher values when longer intervals are considered. The assumption that the past landslide frequency can be used to describe the future landslide occurrence was not proved in the study area.

The susceptibility assessment was performed with unique conditional analyses using a limited number of thematic factors including slope and aspect information, geomorphological units, and a map of the genetic slope types. Geomorphological units were mapped mainly in the field with the support of aerial photographs interpretation. Genetic slope types were defined based on the role of river erosion and structural conditions. Geology is not considered in the susceptibility analysis due to the coarse geological unit subdivision (the map shows only one type of granitic rocks cropping out in the area).

The susceptibility zonation indicates that the majority of the Inca City is located on stable ground surrounded by slopes with different degree of landslide susceptibility. The landslide susceptibility performance (i.e. the ability of model to explain the landslide the training dataset) was good, but the validation (i.e. the ability of model to explain new landslide dataset) results were quite poor. This could be explained by the lack of some relevant environmental factors that partly control the spatial landslides distribution (e.g. structural and lithological conditions). An attempt to improve the predictive skill of the susceptibility assessment, will regard the application of different multivariate statistical approaches in the study area.