Geophysical Research Abstracts, Vol. 9, 00601, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00601

Assessing the rainfall-induced shallow landslides recurrence

D. Salciarini (1), P. Conversini (1), W.Z. Savage (2)

(1) Department of Civil and Environmental Engineering, University of Perugia, Italy, (2) U.S. Geological Survey, Denver, Colorado

To manage the hazard associated with shallow landslides, decision makers need an understanding of where and when landslides may occur, and how widespread the landslide event will be. In addition, estimates of the frequency of conditions likely to cause landslides are critical for quantitative risk and hazard assessments. Most landslide forecasting tools are based on susceptibility maps that do not include the temporal component of the hazard. To transform landslide susceptibility maps to landslide hazard maps the temporal information needs to be included, since hazard is usually defined as the probability of occurrence of a potentially damaging phenomenon within a given area in a given period of time. If slope movements are induced by rainfall, the landslide susceptibility analysis can be coupled with the statistical treatment of rainfall data (frequency analyses), and results can be incorporated in the modeling procedure for landslide recurrence assessment. In this contribution we show how the TRIGRS shallow-landslide model, a physically based, spatially distributed model, has been extended by a newly-developed module CRF (Critical Rain Fall). This module allows the estimation of the return periods of rainfall that cause distributed slope failures, given the physical and geometrical characteristics of regional topography. Rainfall events of different durations can be extracted for a study site based on historical datasets, using a Generalized Extreme Value (GEV) distribution to give the 1-, 3-, 6-, 12-, 24-, 48-, and 72-hour rainfall totals and intensities associated with return periods of 1, 2, 5, 10, 25, 50 and 100 years. Then, the TRIGRS model and the CRF extension are applied to simulate shallow landslide recurrence as a function of rainfall duration and hillslope characteristics on a spatially distributed basis. First, we provide a description of the test area, located in Central Italy and then, introduce the theoretical basis of our approach that couples a deterministic solution for the hillslope response to a rainfall

on the ground surface with a probabilistic assessment of expected rainfalls. Following this, we describe the application of the model and the results and conclude with a discussion on the effectiveness of this approach and the potential for further research.