Mapping landforms for landslide hazards assessment on the SW flank of Pico de Orizaba volcano, Puebla-Veracruz, Mexico

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with 3 figures and 1 table

Summary. Landslides that occur along stream systems are very common and have the potential to damage human settlements and economic activities. On the highest mountains in Mexico the potential for landslides and debris flows is great because of the large area of weakened rocks at high altitudes and under high seasonal rainfall. In Mexico, in spite of the effort to represent and assess slope stability by local authorities and scientists, there is a lack of standardized and systematized landslide inventory maps, landslide hazard maps, and related geo-databases that support the prediction of future slope instability. The present work illustrates a method to analyze the distribution of landslides and characterize landforms that are prone to slope instability. For the Río Chiquito-Barranca del Muerto watershed on the southwestern flank of Pico de Orizaba volcano, landforms and landslide distribution were ascertained through a landslide inventory map created from multi-temporal aerial photographs, field investigations and, an adaptation of the Landslide Hazard Zonation Protocol of the Washington State Department of Natural Resources, Forest Practices Division, in a GIS-based technology. This analysis divided the watershed into 12 mass-wasting landforms that were assigned slope-stability hazard ratings from low to very high. The overall hazard rating for this watershed was very high.

Key words: GIS, geomorphometric mapping, landslide inventory map, landslide hazard map, Pico de Orizaba Volcano

Introduction

Worldwide, inventory mapping of landslides is the first step toward assessment of susceptibility, hazard, and risk (Castellanos Abella & Van Westen 2008, Hervás & Bobrowsky 2009, Guzzetti et al. 2012, Legorreta et al. 2013). In Mexico, efforts to achieve this have used Geographic Information Systems (GIS) & remote sensing (Capra et al. 2006, García-Palomo et al. 2006, Pérez-Gutiérrez 2007, Secretaría de Protección Civil 2010). Despite these efforts, there are few landslide inventory maps, landslide hazard maps, and related geo-datasets that systematically record the type, abundance, distribution, and hazard within any region of Mexico. There is no standardized procedure to prepare inventory or hazard maps. Pico de Orizaba volcano, is highest mountain in Mexico (5,675 m a.s.l.), which is affected by continuous gravitational processes because of the long-term weathering of its rock by...