Landslides-triggering rainfall thresholds in the Aburrá Valley, northern Colombian Andes

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Rainfall-triggering landslide represents a major hazard in the Colombian Andes, 90% of landslide reports shows rainfall as the triggering cause. In developing countries, landslides have amply demonstrated its destructive capacity, causing huge human and economic losses, especially in tropical and mountainous terrain, such as the Aburrá Valley. For these reason new studies on forecasting, real-time monitoring and critical rainfall thresholds have become essential tools for the implementation of early warning systems. This analysis of critical rainfall thresholds for landslide forecasting in the Aburrá Valley was performed using an empirical procedure based on 7,239 landslide reports from DESINVENTAR and SIMMA landslide inventories, and historical precipitation of 68 years (1948-2016) from 16 homogeneously distributed raingauges with 15-minutes sampling frequency. Spatial and temporal variability of precipitation in the valley was studied, analyzing the hourly, diurnal, interannual and intrannual cycles and patterns and its relationship with landslide occurrence. The conditional probability of having a landslide given that rainfall triggers exceed a certain threshold value for a certain time period was obtained considering the influence of daily and antecedent rainfall. Finally an excedence probability curve was obtained for all the scenarios considered. The results obtained could facilitate the implementation of a regional early warning system based on these rainfall thresholds.

Keywords: Landslide, rainfall, tropical environments, mountainous terrains.