



Rainfall patterns associated to shallow slope movements in Povoação County (São Miguel Island, Azores)

R. Marques (1), J.L. Zêzere (2), R.M. Trigo (3), J.L. Gaspar (1)

(1) Centro de Vulcanologia e Avaliação de Riscos Geológicos, Universidade dos Açores, (2) Centro de Estudos Geográficos da Universidade de Lisboa, (3) Centro de Geofísica da Universidade de Lisboa

rtmarques@notes.uac.pt / Fax: +351-296650142

São Miguel, the largest island of the Azores archipelago, has been affected by several destructive landslides in the last five centuries, triggered either by earthquakes, volcanic eruptions and rainfall episodes, that were responsible for many deaths and very important economic losses.

The Povoação County is located in the south-eastern part of S. Miguel, and is one of the most landslide prone zones in the island, considering the prevalence of very steep slopes associated with permeable soft volcanic soils and fallout deposits.

Historical accounts and recent observations show that rainfall induced landslide events are frequent in the area. The most recent catastrophic episode took place on the 31st October 1997 when more than 1000 soil slips and debris flows killed 29 people in the small village of Ribeira Quente.

The role of rainfall on regional landslide activity was analysed applying cumulative rainfall methods. This analysis was carried out using 26 years (1976-2001) of daily precipitation registered at the reference meteorological station of Lagoa das Furnas. The method comprises the reconstruction of antecedent rainfall for 1, 2, 3, 5, 10, 15, 30, 40, 60, 75, 90, 120 and 150 consecutive days before each major landslide event. The return period of the obtained rainfall amount-duration combinations was computed based on the extreme values theory, applying the Gumbel's extreme values distribution. The critical rainfall combination (quantity-duration) responsible for each

landslide event was assessed, assuming as critical pair the one with the higher return period.

It appears to exist a two stage pattern of precipitation which induced most of the landslide occurrences: a preparatory rainy period, when slopes are destabilized and conditioned for failure, followed by a more intense and short rainfall episode that triggers the landslide. The impact of the most important mode of atmospheric circulation in the Northern Hemisphere, the North Atlantic Oscillation (NAO), on the regional precipitation regime was evaluated. It is shown that the monthly precipitation of São Miguel has a significant negative correlation with the NAO index, resulting from NAO control on the travelling latitude of most storm-tracks that cross the Northern Atlantic Ocean.