



Spatio-temporal prediction of landslide hazard in Subcarpathian Area, between Prahova and Ialomita Valleys, Romania

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Assessment of landslide hazard requires usually identification of location, time and magnitude of future landslides. Because of the lack of detailed data regarding the precise time and landslides runout distance, most of the studies are limited to evaluation of spatial occurrence. In this study we focus on the estimation of spatial and temporal occurrences of landslides at a medium scale for the Subcarpathian area between Prahova and Ialomita Valleys, Romania, using statistical analysis of past landslides in relation with the predisposing and triggering factors. This area is located in the western part of Curvature Subcarpathians, one of the complex geological units in Romania. Heterogeneous geological conditions and the high cost for geotechnical and survey field investigations for an area of 724 km², make difficult the use of a deterministic approach at medium scale (1:25,000). For this reason the methodology is based on landslide inventory analysis, landslide susceptibility assessment and landslide frequency analysis. The landslide inventory was carried out using aerial images from different time series: gray aerial images from 1970, 1977, 1986, orthophotos 2005 and oblique images 2008, 2010. On the 7th, 15th of May 2008 and 25th March 2010 we had three flights over the study area using a small aircraft, model Cessna F172H and a D-SLR camera Canon 400D, 10 Megapixels with Tamron lens 18-250mm. The oblique images were mostly used for visual interpretation of landslides bodies and their evolution. Over 1800 landslides were mapped and classified, some of them being observed for the first time. The landslide inventory was completed with information about landslide occurrence for the latest 36 years (1970 -2005) obtained from local authorities. Landslide susceptibility was performed using bivariate analysis in order to identify the functional relationships between instability factors and the past and present distribution of slope failures (Carrara, 1983). Landslide frequency was calculated by statistical analysis of the past landslide events recorded between 1970 and 2005. The recurrence of triggering factor (precipitations) was calculated based on a rainfall threshold obtained from the mean annual precipitation index. The intensification of extreme rainfall events from the last decade limits its relevance for the landslide frequency analysis. For this reason the hazard maps obtained for different time series (5, 10, 20 years) are based on probability analysis of landslide events