



Earthquake-induced landslide inventory for the Central Ionian Islands using field surveys, GIS tools and aerial orthophotos

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Abstract

Landslide inventories are essential for susceptibility models that predict future landslide generation on the basis of past conditions. In order to create an earthquake-induced landslide inventory, various approaches and techniques can be implemented. By means of post-earthquake field surveys shortly after recent earthquakes and reexamination of the available literature of historical earthquakes with emphasis on their environmental effects, this study gets qualitative and quantitative information on the slope movements induced by all known destructive earthquakes generated in the Central Ionian Islands from the antiquity to present. Moreover, this study inventoried this information within a database designed and developed in Geographic Information Systems environment along with the use aerial orthophotos as an effective interpretation tool. The qualitative information comprises date, location, type, lithology and geotechnical properties of affected formations, pre-existing aggravating factors, potential risks and effects on population, the natural and the built environment. The quantitative information includes the volume of the mobilized material, the distances from the earthquake epicenter and the seismogenic fault, the observed earthquake ground motion characteristics when available as well as the earthquake magnitude and the environmental seismic intensity of the locality. The inventory for the Central Ionian Islands contains data concerning slope movements induced by onshore and offshore earthquakes that have significantly affected Lefkada, Cephalonia and Zakynthos Islands. As regards the temporal extent of the inventory, slope movements are recorded from 1630 to 2015 for Lefkada, from 1636 to 2014 for Cephalonia and from 1513 to 2018 for Zakynthos. In total, 29 out of 57 studied historical and recent earthquakes have induced over 100 slope movements in the Central Ionian Islands. The main result derived from the analysis of this inventory and from the correlation of all pre-existing and new controlling and causing factors is that the vast majority of the induced slope movements are generated along abrupt and high-angle morphological discontinuities (slopes and scarps) strongly related primarily to tectonic structures (active and probably active faults and inactive thrusts and overthrusts) and secondarily to human activities (road cut and artificial slopes). Taking into account that the study area is among the most seismic active areas worldwide and that these movements are mainly observed along tectonic structures, these events could be characterized as structurally controlled. Their distribution supports earlier studies and inventories of earthquake-triggered landslides, which suggests that although earthquake-triggered landslides are abundant

throughout an extensive area from the epicenter, they are concentrated in specific zones associated with the bedrock geology, geomorphology, topography, and human factors.