Inventory of Earthquake-Induced Rock Falls and Taluses in Skolis Mountain in Northwest Peloponnese, Greece

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Abstract

The 2008 Movri Mountain earthquake Mw=6.4 was a destructive earthquake, affecting a significant part of the NW Peloponnese. The earthquake triggered serious ground hazards (surface ruptures, liquefactions, rock falls) and extensive damage to buildings along a 30 km long by 20 km wide area (fig. 1). This study is based on the data base compiled after the earthquake, enriched by remote sensing data that cover a time period of 72 years. The analysis is focused to the west slope of the Skolis Mountain, Western Greece. In this slope we mapped by field work and remote sensing rock fall occurrence and evolution over the last 72 years (fig. 2). We also recognized that over this period the rock falls increase their width, or their length. The terms of width and length are defined along strike or down slope the Skolis Mountain respectively. To improve the reliability of our rock fall evolution model, two different methods have been applied: a) temporal and spatial distribution and b) statistical analysis of rock fall sites, across the Skolis Mountain, over the period from 1945 to 2017. Our rock fall inventory includes 10 time intervals, based on aerial photo interpretation. Analysis and mapping are implemented in a Geographic Information System (ArcGIS). Overall, pre- and post- Movri Mountain earthquake mapping shows significant size changes in rock fall sites and dispersal of boulders (fig. 3). Most of the fallen boulders are characterized by almost rectilinear fall paths. Taluses developed at the base of the slope are supplied by a narrow channel that consisted of small blocks of rocks and boulders. During the Movri Mountain earthquakes rock fall channels migrated upwards and downwards, along pre-existing rock fall deposits. Our analysis shows that the local seismicity appears to have a crucial control on Skolis slope processes influencing rock mass strength resulting in the occurrence of reactivated and newly formed rock falls (fig. 2). These observations are significant for proposing a mechanism of taluses inflation and the isolated boulders tracks for the identification and mitigation of hazard in an area prominent to rock falls.

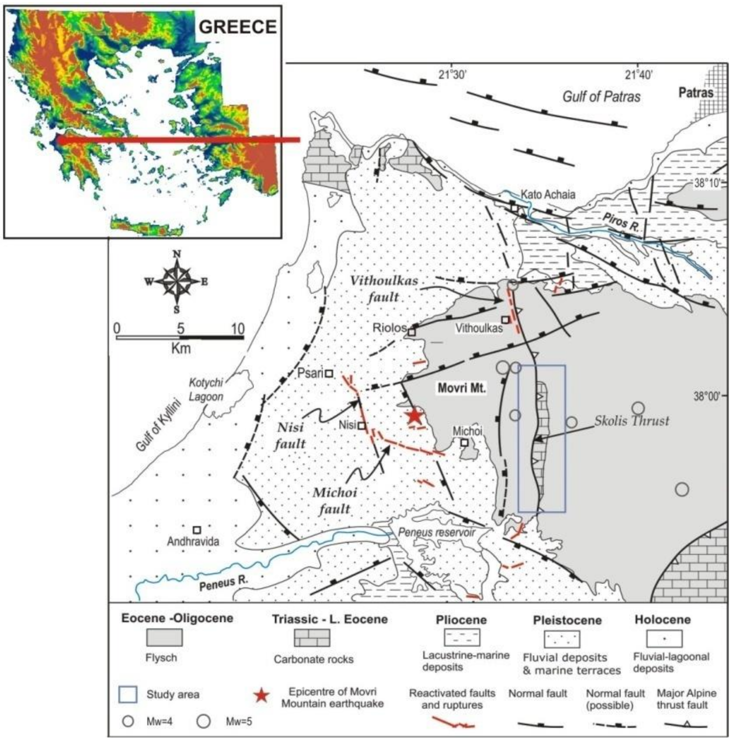

Figure 1. Map of the studied area showing lithology, active faulting and surface ruptures of the 2008 earthquake. The seismicity sequence after the 2008 earthquake is reproduced from www.gein.noa.gr.

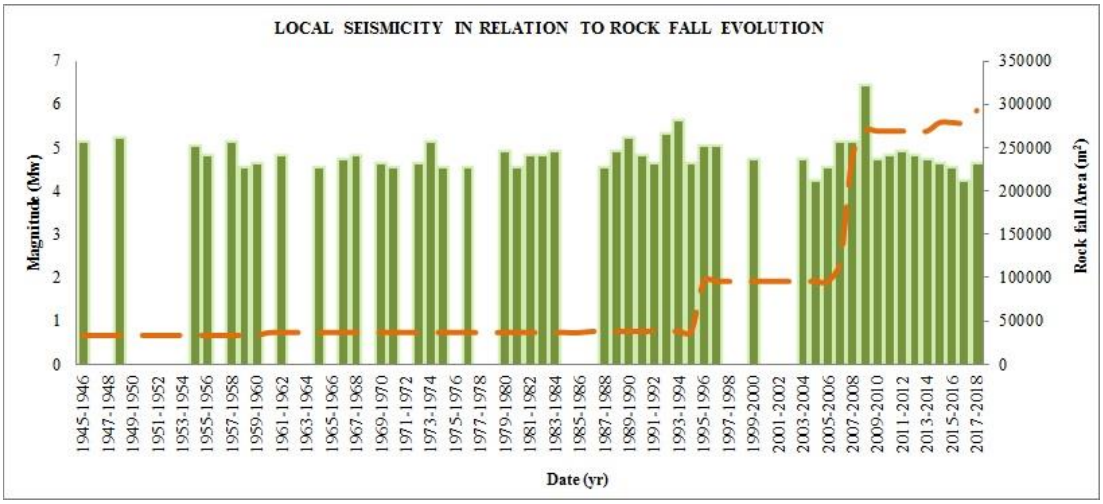

Figure 2. Diagram of seismicity in Skolis Mountain region that affected the size of rock falls over the period 1945 - 2017. The green columns represent the magnitude and the dashed orange line the evolution of the rock fall area. The range of the affected area is defined by the range of the map in figure 1.



Figure 3. Steep rock cliffs of the Skolis Mountain and Helicopter post-earthquake views of rock-falls and taluses.

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