Spatial and temporal evolution of a recurrent landslide - Ropoto, Greece

Sotiris Valkaniotis\textsuperscript{1}[0000-0003-2802], Efstratios Karantanellis\textsuperscript{2}[0000-0002-6514-7789], Athanasia Vassou\textsuperscript{2}, Vasileios Marinos\textsuperscript{3}[0000-0001-7575-7006], George Papanassiu\textsuperscript{4}[0000-0002-9410-0883]

\textsuperscript{1}Koronidos 9 str., Trikala, Greece
\textsuperscript{2}Department of Geology, Aristotle University of Thessaloniki, 54124, Thessaloniki, Greece
\textsuperscript{3}School of Civil Engineering, National Technical University of Athens, 15773, Athens, Greece
\textsuperscript{4}Department of Civil Engineering, Democritus University of Thrace, 67100, Xanthi, Greece

\texttt{gpapatha@civil.duth.gr}

Abstract. Landslides are considered as one of the most hazardous geological phenomena at mountainous areas that can severely affect the man-made environment increasing the risk. The triggering of slope failures is mainly related to extreme events of rainfall and the occurrence of earthquakes. Studying the landslides is mainly achieved either on small scale (prefecture or state) or on large scale (slope). The former case is realized with geospatial analysis, while the latter one is analyzed based on data provided by LiDAR and UAV – related technology and methodology. The latter approach has been exponentially developed the last decade offering a valuable and reliable tool to the community of geosciences for monitoring the landslide activity and compiling relevant evolution maps based on multi-temporal studies.

This study focuses on the mountainous area of Ropoto, Thessaly, Central Greece where consecutively landslide incidents were reported the last 50 years. Geologically, the area of interest mainly consists by flysch formation that presents significant high heterogeneity (siltstones, conglomerates, sandstones, limestones, shales, marls), while transition beds consisted of thick-bedded limestones with sandstone and shale and the thin-bedded limestone formation are also mapped. This geologically mixture in conjunction with the intense period of rainfall during winter is the dominant triggering factor of large-scale landslides that induced severe damage to most of the houses located at the central area of the village. The consequence of this landslide activity is that the population is forced to abandon their homes within this heavily damaged area.

The basic goal of this study is the evaluation of the rate of the landslide activity at the village of Ropoto. More specifically, the spatial and temporal evolution will be analyzed, and zones of differential landslide activity will be delineated. In order to achieve this, a set of multi-temporal high resolution topographic and imagery data is used to compute 3D displacement, volumetric differences and identify surficial features and land cover changes. High resolution topographic data from historical aerial imagery and UAV surveys are co-registered and differenced using various available methods & algorithms (e.g. ICP, M3C2 etc). Results from different methods are presented and compared with each other, highlighting similarities and constraints for each one.
Keywords: Landslide, evolution, Flysch, Change Detection, Photogrammetry, temporal, activity