



## **The influence of the maintenance of terraced areas on slope stability during the November 2014 flood event in Liguria (northwestern Italy)**

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Terraced environments are a widespread feature of the coastal settlement of eastern Liguria (northwestern Italy) and they constitute a well-known favorable role in slope stability. In this region, starting from the twentieth century, the progressive abandonment of agriculture determines a progressively increasing lack of maintenance of the terraces, consequently raising the level of slope instability. Moreover, it should be taken into account not only the level of terraces maintenance, but also their interaction with several factors as i) geological and geomorphological conditions, ii) soil properties, iii) hydrological and hydrogeological conditions, and iv) land use, causing an increase in landslides occurrence.

The definition of managed terraces effects on slope stability and their response to external stress like a flood event is rather complicated; a possible approach is a statistical analysis of the effects of a flood event over a large terraced area, distinguishing the maintained sectors from the abandoned ones. After the November 2014 flood event, which affected several sectors of the Liguria region, where a high number of shallow landslides were triggered, an airborne LiDAR survey of the damaged area was carried out.

In particular, a high resolution Digital Terrain Model (DTM) resampled to a lower density (1 square meter grid spacing) and a photogrammetric coverage of the area was performed, in order to create a landslide map of the flood event.

The surveyed area covered more than 380 square kilometers, and over 1600 shallow landslides triggered by the flood event were identified and inventoried. The high resolution DTM allowed the identification of terraced areas also in wooded sectors and a sharp mapping of the extension of terraced slopes in this portion of Liguria region. By considering: i) the terraced areas recognized through DTM analysis, ii) the mapped landslides, and iii) the land use classification, a correlation between the presence of terraces, their level of maintenance and the dimension and the type of occurred landslides was defined. The highest number of smaller landslides was observed in cultivated and maintained terraced areas, whereas the main landslides occurred in abandoned terraces, nowadays covered with scrubs and forest. This first approach represents a starting point to face the complex theme of the interaction of shallow landslide susceptibility and land use evolution over time, with a focus on the role of the maintenance of terraced areas for the purpose of landslide risk mitigation.