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Geomorphological change detection and historical evolution analysis of terraced landscapes, an old irreversible agricultural practice: the case study of Minori, in Campania Region

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Terraced landscapes construction started in the Neolithic, since humanity felt the need to model mountains and steep slopes for making them habitable and arable, exploiting the fertility of those territories. Although they are largely spread in the Mediterranean area, the terraces in Amalfi Coast need specific care because they determine the territory beauty, making its unique landscape, and, in addition, they are an important proof of the cultural heritage. Therefore, those areas have been included in the World Heritage List, protected by UNESCO. Unfortunately, they have been subject to quick abandonment due to their inadequate economic competitiveness and the scarce interest of the young in that kind of agriculture. This trend is responsible for a lack in the maintenance of terraces and, consequently, of their collapse or the increase of the hydrological instability of those territories. Among the municipalities of Amalfi Coast, Minori, surrounded by terraces, is one of the most famous because it is the most ancient, since it has been founded in 1th century AD. It was the object of some catastrophic raining events, as in 1954 (a shower of 500 mm in 24 hours). For those reasons, Minori has been selected as the study area of the current research work. The geomorphological changes and the transformation of the terraces in Minori has been analysed over a sixty years period (1956-2017), in order to provide a good base of information on which planning and editing the future maintenance strategy of those areas. To meet the purpose of that work, the historical photogrammetric aerial photos of 1956 and of 2017 have been acquired from the Italian Military Geographic Institute (IGM) and by an own flight, respectively. Both datasets have been processed separately using the Structure from Motion method applying Agisoft Photoscan Professional. The pre-processing steps regarding the picture alignment and the tie point extraction have been improved by importing the ground control points (GCPs), taken in three different field campaigns using a Differential Global Position System (DPGS). The GCPs dataset has been divided in two groups: the former applied in the reconstruction phase, and the latter used in the error analysis stage. A high resolution Digital Elevation Model (DEM) and a fine scale orthophoto have been generated from both datasets. The generated DEM resolution was equal to 0.48 and 0.1 m for 1956 and 2017, respectively; while, the obtained orthophoto resolution was equal to 0.24 and 0.07 for 1956 and 2017, respectively. The assessment of geomorphological changes, pixel by pixel, has been performed computing the DEM of Difference (DOD), subtracting the DEMs of the two periods. The DOD positive values are linked to new human constructions while the negative value are due to collapse and soil erosion process. On the contrary, the area transformation detection has been obtained by comparing the two photogrammetric orthophotos. That comparison shows that terrace extension has not been amended, while the amount of human constructions have increased for about 800% between 1956 and 2017.