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Degradation of terraced slopes in Mediterranean conditions

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Agricultural terraces with dry-stone walls take the largest area of all man-made landforms in Mediterranean mountain regions. Despite on that their contemporary morphodynamics have not been the subject of many studies. It is a significant problem both from a scientific and a practical point of view.
The aim of the study was to estimate the influence of relief, lithology, climatic conditions, methods of wall construction and actual agricultural practice on the degradation of agricultural terraces. A field study was conducted in Greece on 7 plots with the overall area of over 42 000 m2 – on the east Crete and on two Aegean islands – Ikaria and Thera. The analysis was conducted on terraced slopes with gradient of 8-23o, built of granitoids, gneisses, crystalline schists, limestones, crystalline dolomites and volcanic tuffs. There was identified the types of terrace walls. Metrical features of terrace systems were ascertained on the basis of GPS RTK measurement. Terrace material petrography and grain size distribution was identified for regolith an soil samples taken from the selected outcrops which were recognized as being representative for 239 georadar profiles of the joint length of over 2500 m. On that basis the volume of each terrace material was defined. The rills cutting the fields and the walls were measured. The infiltration rate was also taken in 130 points.
Reasearch showed that regardless of metrical features of terraces, soil grain size distribution and thickness of the terrace material, the most important reason for the destruction of terrace walls is the abandonment of cultivated areas. Changes in cultivation methods and the introduction of pasturage visibly accelerate the degradation processes. On areas unused for 30 years terrace walls are destroyed on over 25% of their length. It concerns both the areas on which filtration coefficient (k) reaches about 10-5m•s-1 as well as the ones where it is a 100 times lower. The least varied values (10-6-10-5m•s-1) came from the measurements of gneisses and granitogneisses, where muddy sandy and gravelly material prevail. On volcanic tuffs the k coefficient reached the order of magnitude of 10-7-10-5m•s-1. The most varied infiltration rates were observed on limestones and crystalline dolomites – depending on thickness of loamy soil material and density of cracks the k coefficient reached from 5•10-9m•s-1 up to 6•10-4m•s-1.
An important factor of slope degradation is also the way of making terrace dry-stone walls, independently of the fact if they are 0,5 m or 3 m high. The walls with buried lower part or situated directly on solid rock which are wider at the foundation are far more lasting than the ones facing stones. In this last case damage takes up to 80% of the length of the walls even on the terraces used nowadays. On Ikaria Island during the field study period well constructed and preserved dry-stone walls survived daily precipitation of 300mm and stay intact.