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Monitoring soil erosion in terraced catchments in Mediterranean regions: a field experiment in Cyprus

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Terraces retained by dry-stone walls are very common features in mountainous Mediterranean environments. These structures provide accessible agricultural land on steep slopes, favoring water infiltration and reducing water runoff and soil erosion. However, during the last decades, an increasing trend of agricultural land abandonment has resulted in a lack of maintenance of the terrace walls and the onset of a general process of land degradation. The objective of this study is the quantification of soil erosion in a small terraced catchment (10,000 m^2), located on the north-eastern slope of the Troodos Mountains (Cyprus), at an elevation of 1,300 m a.s.l. The catchment is cultivated with vineyards and it is representative of the main agricultural land use in the Troodos region. Soil erosion is measured by sediment traps and laser scans are made to assess changes in terrace geometry. In addition, a weather station measuring rainfall, temperature and relative humidity has been installed in the catchment, along with 18 soil moisture sensors, to relate soil erosion processes with climate and (sub)surface hydrology. A total of 10 sediment traps, five pairs, have been installed in the study site, catching five well-maintained sections of a dry-stone wall and five degraded (collapsed) sections. Each trap is 1 m wide. In detail, two terraces, 11 and 14 m long, located at the same elevation and separated by a strip of natural vegetation, are monitored with four and six traps, respectively. To get a complete picture of the erosion processes occurring on the selected area, the trap pairs collect sediment from both the collapsed and the well maintained wall sections of the two terraces. In addition, terrace area of two traps is delineated by metal borders (1x4 m^2) to relate erosion rates to a known drainage area. The sediment traps are emptied after all rainfall events. At the beginning and end of the rainy season, a laser scanning survey of a terrace located uphill of the ones monitored by sediment traps is performed. The scan produces a point cloud with a resolution close to 2 mm. The comparison of the 3D models derived in different times allows detecting changes in the terrain topography, which can be transformed in to erosion rates knowing the soil bulk density. The preliminary results of the monitoring experiment, which started at the beginning of November 2015, show erosion rates an order of magnitude higher in the collapsed sections of the terrace wall in comparison to the preserved ones. A more comprehensive analysis relating erosion rates to precipitation intensity, assessing yearly erosion rates in degraded terraced environments and comparing different monitoring techniques are expected at the end of the rainy season (April).