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Changes of Soil-Water-Plants relationships at abandoned field hillslopes along a pluviometric gradient in the South of Spain.

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The trend towards a more arid climate conditions in some areas of the Mediterranean environments will positively feedback the desertification enhancing the soil degradation processes. Several researchers have established that some soil properties can be used as indicators of desertification and of soil degradation. One of those properties is the soil water content, highly dependent of the rainfall in the Mediterranean. Soil water content is one of the main indicators to asses the recharge of water supply for the vegetation survival, and therefore affect to the organic matter and organic carbon cycle in the short time. This study presents the results of the monitoring of soil water content, some physico-quemical soil properties and the vegetal cover from three hillslopes of abandoned fields, affected by sporadic grazing, during four years (2002-06) under different climatic conditions, in order to evaluate the survival possibilities of the vegetation, which re-colonized those abandoned fields, faced to a decrease in water supplies a cause of the Climate Change in Mediterranean.
The research was carried out in the South of Spain, where there is a climatic gradient from the Strait of Gibraltar (1,500 mm year-1) to Cape of Gata (150 mm year-1), and which is one of the most affected areas by the soil degradational processes in the Western Mediterranean. Three hillslopes were selected along the study area, under three different climatic conditions (sub-humid, dry-Mediterranean and semi-arid), with similar topography, geology and original landuse. The differences between them were originated by the climate, which implied changes in vegetal cover and geomorphological processes. Soil water content was measured with a TDR-Tektronix at two depths (5 and 15 cm) since Nov-2002 to Sep-2006, from bottom to top every 10 m along the hillslopes. Vegetal cover was measured by means of a detailed photo-interpretation. Rainfalls were collected in rain gauges located in each field site.
Final results shows the direct dependence of the soil water content from the rainfall events, as it is usual in Mediterranean. The presence of a period of drought (2004-06) during the monitoring let us to observe the incidence of reduction in the rainfall volumes. 2002-03 and 2003-04 years registered normal volumes of rainfalls and the soil water content followed the climatic gradient of the region: a decrease with the reduction of the rainfalls. Oppositely, during 2004-05 and 2005-06 years, the drought period, it was observed a significant reduction of soil water content for all hillslopes along the pluviometric gradient, although the effects were more evident at the hillslope in transition between sub-humid and semi-arid conditions. The lack of water into the soil caused the reduction of water available for vegetation. This led to a change in the vegetation pattern under different climatic conditions: a decrease in vegetal cover, the number of plants, and herbaceous growth; and an increase in the bare soil exposed to raindrop impacts and runoff. Hence, decreases in soil moisture content causes changes in the vegetal cover that could reduce the organic matter supply making soil aggregates more unstable with reduced soil permeability and water supply for vegetation, enhancing a positive feedback process of degradation. The observed changes related to increasing aridity during the drought period will lead the hillslopes eco-geomorphological system towards a more unstable equilibrium and special attention must be given to areas between sub-humid and semi-arid conditions because they could be used as sensitive indicators of the ecogeomorphological system responses in the Climate Change context.