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Determination of the desertification processes by means of the some soil physico-chemical properties analysis along a climate gradient. (South of Spain).

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The pluviometric gradient located in the South of Spain shows one of the European areas affected by desertification processes. In most of the cases, desertification processes are related directly with the hydrological erosion processes, when from the functional point of view could be the consequence. The erosional dynamic along a hillslopes with these soil particles movements generated processes lead to important changes of some properties. Such changes can modify the soil hydrological behaviour with a soil productivity loss and consequently a vegetation cover reduction, favouring the soil erosion processes what have been termed feedback processes, which final will be the appear of non-return situations.
Mainly, such soil properties are aggregate stability, porosity, gravels, clay, organic matter, soluble salt, carbonate content, soil organic carbon, cationic exchange capacity and saturated hydraulic conductivity. Also the soil erodibility was calculate through the K factor of USLE.
The investigation boards the study of the mentioned processes through the methodology of the analogue situations reproduction in the South of Spain (Bethics Chain) and along a climatic gradient. They are areas with metamorphic rocks (schists anf filithes), high slope gradient and very shallow soils due to a historical management in the most of the cases. Has been defined a climatic gradient at this area, which fluctuates from 1100 mm/y-1 at Gaucin, 750 mm/y-1 al Marbella, 590 mm/y-1 at Almogia, 330 mm/y-1 at Berja and 240 mm/y-1. at Gergal.
The soils samples were collected in the south facing slopes, of each field site, and the amount of soil were 60 in each field site, with one total amount of 300 soils samples. We have selected a representative hillslopes with a similar exposition and length in every one of each area.
The final results shown modifications in the soil and hydrological properties studied with the increasing of the aridity, and the protector role of vegetation cover. Such changes suppose the soil degradation what make us to suspect the existence of desertification processes.
Physical and hydrological soil properties analysed shown a higher relationship soil-water-plant, tend to the soil degradation along a pluviometric gradient selected. Biothic and abiothic factors are going to be more degraded according with a reduction of pluviometric gradient.
The soil degradation observed across the analysis of the more stable soil properties, that we can denominate from the slow cycle, bring as a consequence an important reduction of the vegetation cover, and therefore in the soil protection, decreasing their soil moisture content and their soil permeability and the cationic exchange capacity, as good key factor to determine the soil health. When these processes take place, an increase of runoff, high pedregosity and crusting may occur in the soil surface.
Concerning the regional scale spatial variability, results of experimental field work conducted along a climatic transect, from the Mediterranean climate to the arid zone in the south of Spain, show that: (1) organic matter content, and aggregate size and stability decrease with aridity; and (2) the rate of change of these variables along the climatic transect is non-linear. A steplike threshold exists at the semiarid area, which sharply separates the Mediterranean climate and arid ecogeomorphic systems. This means that only a relatively small climatic change would be needed to shift the borders between these two systems. As many regions of Mediterranean climate lie adjacent to semiarid areas, they are threatened by desertification in the event of climate change.
Along a hillslope there is a high spatial variability concerning to the soil physical properties. However, in the more stable soil properties there is a bigger intra-hillslope homogeneity when increases the pluviometric gradient. On

the contrary, the more unstable soil properties, offer bigger homogeneity in the more semiarid hillslopes, specially when the soil present more degraded conditions.

The analysis of the soil properties shown a higher and inverse correlation between soil degradation levels and organic carbon sequestration capacity.

Finally, the soil properties considered have been good key indicators to evaluate the soil degradation along a pluviometric gradient, the incidence of the desertification processes and the soil pathology.