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Structure-dependent organic matter storage in mediterranean mountain soils

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Soil aggregation is one of the mechanisms of carbon storage. The stability and size of organo-mineral structure fractions can be used as indicators of the quality of soils as carbon sinks. Moreover, their relation with soil structure will help to determine the best soil management practices to preserve their quality.

Organic matter and structure of seven soils from the pre-pyrenean range in Catalonia (NE Spain) covering altitudinal (750 to 1420 m), and landuse (pasture, crops, forest) ranges were studied. They are classified as Calciustepts, Ustifluvents, Udorthents, and Calciudolls. Analyses consisted in aggregate fractionation, organic carbon analyses of the different fractions and micromorphological quantification of porosity of undisturbed samples and aggregate fractions.

The soils are neutral to slightly alkaline (pH 7.5 to 8,6) and non saline. Surface horizons have C contents between 2.3 and 11%, and subsurface horizons between 2 and 6.7 %. Nitrogen contents vary between 7.6 and 24.5%, and their origin is mostly organic (N(%)=0.039C(%) + 0.073; R2 0.80). C/N ratios are from 10 to 30, indicating a mull or moder humus type, due to a vegetation of conifers and grasses.

The amount of organic carbon stored in these soils show the highest values related to alluvial, deep soils (243 Mg C/ha), and the lowest corresponding to a shallow, stony soil with a low plant cover (62 Mg C/ha).

The mean aggregate diameter according to Kemper & Rosenau (1986) (aggregates $<$ 2mm) is from 1.18 and 1.36 mm and very similar for all soils. The aggregate size

distribution is bimodal: the most frequent are the ones between 1 and 2 mm, followed by those less than 0.25 mm.

The organic matter contents of the aggregates larger than 1 mm show that the smallest aggregates of surface horizons have the highest OC contents. The results suggest that the structure mechanisms at the surface, with more biological activity and high root content are more active in the smallest aggregates, while subsurface horizons, with larger blocky structures are affected by other structuration processes.