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Preliminary results of the evolution of total and organo-mineral associated SOC after land abandonment in Mediterranean climate (South of Spain)

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Land abandonment has been one of the most important land use change in European Mediterranean countries over the last decades. After this conversion, a secondary succession process begins, during which soil organic carbon (SOC) is usually assumed to increase due to the intensification of plant residues inputs to soil, above as well below ground. However, in order to determine the stability of the sequestered SOC and the reversibility of the process, it is crucial to identify the degree of association and protection of carbon incorporated to soil. The objectives of this study are: i) the estimation of SOC dynamic after land abandonment along a precipitation gradient (1085-650-350 mm y-1) and ii) the level this SOC is protected against decomposition and the influence of precipitation in this process. Plots abandoned in different periods (chronosequence) were selected on each site. Samples were dried and sieved at 2 mm. Total SOC was determined combining spectrometry and dry combustion. The different pools of SOC were isolated by wet sieving. The soil fraction < 2 mm was dissolved in a solution of Na-hexametaphophate and shaken for 1 hour. Then the solution was sieved at 250 μm and 50 μm, obtaining three fractions: i) sand + particulate organic matter (POM) (> 250 μm), ii) sand + POM + microaggregates (50-250 μm) and iii) silt + clay (<50 μm). SOC concentration increased following a logistic model in the two wettest sites, being increment rates proportional to precipitation. In site 1 (wettest) SOC concentration was 11.2 and 23.2 gr C/Kg in cultivated and never cultivated plots. In site 2 these amounts were 8.1 and 24.0 gr C/Kg. In the site 3 (driest) no SOC accumulation was measured and the equivalent measurements were 11.3 and 13.7 gr C/Kg. Along the secondary succession, SOC concentration in the silt + clay fraction increased (e.g. from 8.0 to 20.4 gr C/Kg of silt + clay fraction in site 2), but the proportion of carbon in this fraction over total SOC decreased from 84% to 52%, due to the incorporation of silt and clay into microaggregates and the increment of POM content. This means that, taking in account only total SOC, carbon sequestration could be overestimated because some carbon incorporated to soil remained unprotected.