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# Distribution of soil organic carbon and other soil properties across an eroding-deposition catena in an old olive orchard

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Trees crops are cited as being severely affected by water erosion in the Mediterranean region and much attention has been paid to soil degradation in this system. Organic carbon is one of the most relevant soil properties for is relation to soil quality and the potential of soil as a $CO_2$ sink. It is well known that erosion and deposition processes have a significant influence in the spatial distribution of soil organic carbon (Kirkels et al., 2014). It is also well known that the distribution of soil organic carbon in its different fractions (Six et al. 2002) is of key importance to understand its fate in the soil under different conditions. Although the distribution of soil organic carbon has been recently studied in olive orchards (Vicente-Vicente et al., 2017), its spatial variability due to erosion and deposition processes has not been studied under such specific agro-ecosystem.

This communication presents some preliminary results of a study in an old olive orchard where previous investigations on historical and recent soil erosion rates have been carried out (Mabit et al., 2012). In a 430 m transect along a catena within this olive orchard, several soil samples were collected in eroding and deposition areas previously identified using the Cs-137 technique at different depths (0-10, 10-20, 20-30 and 30-40). These samples were analyzed for total organic carbon concentration and concentration in the unprotected, physically, chemically and biochemically protected fractions (Six et al., 2002). Isotopic signal, $\delta$13C and $\delta$15N, were determined and as well as organic nitrogen, available Phosphorous, bulk density and aggregate stability, the later only in the top layers. These properties (with the exception of available P and aggregate stability) were also measured in an undisturbed reference area nearby.

The results show how the orchard presents two contrasting areas regarding soil properties. In the eroding area, SOC, available P, organic N, $\delta$15N were significantly lower than in the deposition area, resulting in a significantly different soil degradation status non-degraded in the deposition area and in transition towards severe degradation in the eroded. The organic carbon content in the different fractions was significantly higher in the deposition are with the exception of the biochemically protected in which no differences were detected.
This communication discusses these results and their implications for the appraisal of soil quality and carbon stocks in tree orchards under Mediterranean conditions.

References

Kirkels, F.M.S.A., et al. 2014. Review: The fate of soil organic carbon upon erosion, transport and deposition in agricultural landscapes — A review of different concepts. Geomorphology 226: 94-105.

Mabit, L., et al. 2012. Radioisotopic and physicochemical background indicators to assess soil degradation affecting olive orchards in southern Spain. Agriculture, Ecosystems & Environment 159: 70-80.

Six, J., et al. 2002. Measuring and understanding carbon storage in afforested soils by physical fractionation. Soil Sci. Soc. Am. J. 66, 1981–1987.

Vicente-Vicente, J.L.et al. 2017. Carbon saturation and assessment of soil organic carbon fractions in Mediterranean rainfed olive orchards under plant cover management. Agriculture Ecosystems &. Environment 245: 135–146.