



Soil organic carbon stocks quantification in Mediterranean natural areas, a trade-off between entire soil profiles and soil control sections

Luis Parras-Alcántara (1), Beatriz Lozano-García (1), Eric. C. Brevik (2), and Artemi Cerdá (3)

(1) Cordoba, Faculty of Science, Agrifood Campus of International Excellence - ceiA3, Agricultural Chemistry and Soil Science, Cordoba, Spain (qe1paall@uco.es), (2) Department of Natural Sciences, Dickinson State University, Dickinson, ND 58601, USA., (3) Department of Geography, University of Valencia, Blasco Ibáñez 28, Valencia, 46010, Spain

* Corresponding author: Luis Parras-Alcántara, Tel.: +34957211092; fax: +34957212146; E-mail: luis.parras@uco.es; qe1paall@uco.es

Abstract

Soil organic carbon (SOC) is extremely important in the global carbon (C) cycle; also, SOC is a soil property subject to changes, inasmuch as SOC is highly variable in space and time. The scientific community is researching the fate of the organic carbon in the ecosystems and this is why there is a blooming interest on this topic (Oliveira et al., 2014; Kukal et al., 2015). Soil organic matter play a key role in the Soil System (Fernández-Romero et al., 2014; Parras-Alcántara and Lozano García, 2014; Lozano-García and Parras-Alcántara; Parras-Alcántara et al., 2015). Globally it is known that soil C sequestration is a strategy to mitigate climate change. Over time, some researchers have analyzed entire soil profiles (ESP) by pedogenetic horizons and other researchers have analyzed soil control sections (SCS) (edaphic controls to different thickness), and in each case the benefits of the methodology established was justified. However, very few studies compare both methods (ESP versus SCS). This research sought to analyze the SOC stock (SOCS) variability using both methods (ESP and SCS) in The Despeñaperros Natural Park, a nature reserve that consists of a 76.8 km² forested area in southern Spain. The park is in a Mediterranean environment and is a natural area (free of human disturbance). Thirty-four sampling points were selected in the study zone. Each sampling point was analyzed in two different ways, as ESP (by horizons) and as SCS with different depth increments (0-25, 25-50, 50-75 and 75-100 cm). The major goal of this research was to study the SOCS variability at regional scale. The studied soils were classified as Phaeozems, Cambisols, Regosols and Leptosols. The total SOCS in the Despeñaperros Natural Park was over 28.2% greater when SCS were used compared to ESP, ranging from 0.8144 Tg C to 0.6353 Tg C respectively (1 Tg = 10E12 g). However, when the top soil (surface horizon and superficial section control) was analyzed, this difference increased to 59.8% in SCS compared to ESP. This research is a preliminary assessment for modeling SOCS at the regional level in Mediterranean natural areas.

References

Fernández-Romero, M.L., Lozano-García, B., Parras-Alcántara, L., Collins, C.D., and Clark, J.M.: Effects of land management on different forms of soil carbon in olive groves in mediterranean areas, *Land Degrad. Develop.*, in press, available online: in Wiley Online Library (wileyonlinelibrary.com), doi:10.1002/ldr.2327, 2014.

Kukal, S.S., Saha, D., Sharma, P., and Sharma, B.D.: Profile distribution of carbon fractions under long-term rice-wheat and maize-wheat production in Alfisol and inceptisols of northwest India, *Land Degrad. Develop.*, in press, available online: in Wiley Online Library (wileyonlinelibrary.com), doi:10.1002/ldr.2299, 2015.

Lozano-García, B., and Parras-Alcántara, L.: Variation in soil organic carbon and nitrogen stocks along a toposequence in a traditional mediterranean olive grove, *Land Degrad. Develop.*, 25, 297-304 (2014). <http://dx.doi.org/10.1002/ldr.2284>

Oliveira, S.P., Lacerda, N.B., Blum, S.C., Escobar, M.E.O., and Oliveira, T.S.: Organic carbon and nitrogen stocks in soils of northeastern Brazil converted to irrigated agriculture, *Land Degrad. Develop.*, in press, available

online: in Wiley Online Library (wileyonlinelibrary.com), doi:10.1002/ldr.2264, 2014.

Parras-Alcántara, L., and Lozano-García, B.: Conventional tillage versus organic farming in relation to soil organic carbon stock in olive groves in Mediterranean rangelands (southern Spain). *Solid Earth*, 5, 299–311 (2014). <http://dx.doi.org/10.5194/se-5-299-2014>.

Parras-Alcántara, L., Díaz-Jaimes, L., and Lozano-García, B.: Management effects on soil organic carbon stock in Mediterranean open rangelands—treeless grasslands, *Land Degrad. Develop.*, in press, available online: in Wiley Online Library (wileyonlinelibrary.com), <http://dx.doi.org/10.1002/ldr.2269>, 2015.