Geophysical Research Abstracts
Vol. 19, EGU2017-4357-2, 2017
EGU General Assembly 2017

Redistribution of magnetic iron oxide along soil profile after eight years managing a commercial olive orchard in a Vertisol

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Magnetic iron oxide has been used as a tracer to monitor top soil movement and to identify source of sediments at the short-term scale, after high intensity rainfall events (Guzmán et al., 2010; Obereder et al., 2016) and periods up to two years (Guzmán et al., 2013). As it can be strongly bound to soil particles, its use allows the tacking of tagged soil all over the years until all this soil is lost or it is totally diluted with blank soil making the signal undetectable. Olive orchards planted on Vertisols are subject not only to tillage operations modifying soil profile but also to expansion-compression cycles and cracks appearance due to soil moisture changes. The aim of communication is to assess the soil movement at the mid-term scale, taking advantage of a tracer trial already performed by Guzmán et al. (2013) and a new sampling after 8 years of soil disturbance.
In October 2008 two plots of ∼330 m2 were delimited and in which the top 5 cm of the inter tree rows were tagged with magnetite. Seventy locations at both plots were sampled so as to measure magnetic susceptibility twice (just after the tagging and March 2010), at three depth intervals (0-1, 1-8 and 8-12 cm) and distinguishing two zones: tree and inter tree rows. A third sampling was carried out at 0-2, 2-10 and 10-20 cm in August 2016 at the same locations and zones. Furthermore, in twenty of the sampling points additional samples from 20-30, 30-40, 40-50 and 50-60 cm were taken to check if tagged soil went deeper into the soil profile. Background values of susceptibility and bulk density at each depth, were characterized as well at the three sampling campaigns.
Rainfall, soil management during these years and the inherent characteristics of a Vertisol have enhanced the movement of top soil not only superficially but also within the soil profile. First results comparing the evolution of magnetite distribution along soil profile indicate that while in 2008 and 2010 background values were measured at 12 cm, in 2016, in both zones (tree and inter tree rows) magnetite decreases slightly from the 10-20 cm interval but still finding tagged soil at a depth of 60 cm where background values were nearly reached. The implications of these results on the use of erosion magnetic tracers in long-term erosion experiments and soil vertical fluxes in Vertic soils will be discussed.

References:
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