Geophysical Research Abstracts
Vol. 14, EGU2012-13010, 2012
EGU General Assembly 2012

Citrus orchards management and soil water repellency in Eastern Spain

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Water repellent soils are found around the world, although originally was found on fire affected soil (DeBano, 1981). However, for decades, water repellency was found to be a rare soil property. One of the pioneer research that shown that water repellency was a common soil property is the Wander (1949) publication in Science. Wander researched the water repellency on citrus groves, and since then, no information is available about the water repellency on citrus plantations. The Mediterranean soils are prone to water repellency due to the summer dry conditions (Cerdà and Doerr, 2007). And Land Use and Land Management are key factors (Harper et al., 2000; Urbanek et al., 2007) to understand the water repellency behaviour of agriculture soils. Valencia region (Eastern Spain) is the largest exporter in the world and citrus plantations located in the alluvial plains and fluvial terraces are moving to alluvial fans and slopes where the surface wash is very active (Cerdà et al., 2009). This research aims to show the water repellency on citrus orchards located on the sloping terrain (< 15 % angle slope).
Measurement were conducted in four experimental plots located in the Canyoles River watershed to assess the soil water repellency in citrus orchards under different managements: annual addition of plant residues and manure with no tilling and no fertilizer (MNT), annual addition of plant residues with no tillage (NT), application of conventional herbicides and no tilling (HNT) and conventional tillage in June (CT). The period for each type of management ranged from 2 and 27 (MNT), 1 and 25 (NT), 2 and 27 (HNT) and 3 and 29 years (CT). At each plot, a ten points were selected every 10 cm along inter-rows and water drop penetration time test (WDTP; DeBano, 1981) was performed.
The results show that the MNT treatment induced slight water repellency in citrus-cropped soils compared to other treatments. Small but significant soil water repellency was observed under NT and HNT treatments (mean WDTP 4 $\pm$ 4 s and 2 $\pm$ 2 s, respectively), which may be regarded as subcritical soil water repellency. Slight water repellency observed in soils under MNT treatment may be attributed to the input of hydrophobic organic compounds as a consequence of the addition of plant residues and organic manure. A further issue to be achieved is the study of geomorphological processes associated to sub-critical soil water repellency.
The experimental setup within the citrus plantation is being supported by the research project CGL2008-02879/BTE

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