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Spatial variability in the soil water content of a Mediterranean agroforestry system with high soil heterogeneity

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Variability of soil water content is known to increase with the size of spatial domain in which measurements are taken. At field scale, heterogeneity in soil, vegetation, topography, water input volume and management affects, among other factors, hydrologic plot behaviour under different mean soil water contents.
The present work studies how the spatial variability of soil water content (SWC) is affected by soil type (texture, percentage of stones and the combination of them) in a timber-orientated plantation of cherry tree (Prunus avium) under Mediterranean climatic conditions.
The experimental design is a randomized block one with 3 blocks * 4 treatments, based on two factors: irrigation (6 plots irrigated versus 6 plots not irrigated) and soil management (6 plots tillaged versus 6 plots not tillaged).
SWC is continuously measured at 25, 50 and 100 cm depth with FDR sensors, located at two positions in each treatment: under tree influence and 2.5 m apart. This study presents the results of the monitoring during 2012 of the 24 sensors located at the 25 cm depth. In each of the measurement point, texture and percentage of stones were measured. Sandy-loam, sandy-clay-loam and loam textures were found together with a percentage of stones ranging from 20 to 70 %.
The results indicated that the relationship between the daily mean SWC and its standard deviation, a common procedure used to study spatial variability, changed with texture, percentage of stones and the estimation of field capacity from the combination of both. Temporal stability analysis of SWC showed a clear pattern related to field capacity, with the measurement points of the sandy-loam texture and the high percentage of stones showing the maximun negative diference with the global mean. The high range in the mean relative difference observed ($\pm$ 75 %), could indicate that the studied plot may be considered as a good field-laboratory to extrapolate results at higher spatial scales.
Furthermore, the pattern in the temporal stability of tree growth was clearly related to that one in SWC. Nevertheless, the treatments that represent the mean conditions in growth were not exactly the same than those in SWC, which could be attributable to other characteristics than soil.