Geophysical Research Abstracts
Vol. 18, EGU2016-17191, 2016
EGU General Assembly 2016

Joint Multifractal Analysis of penetration resistance variability in an olive orchard.

Juan Lopez-Herrera (1,2), Tomas Herrero-Tejedor (2), Antonio Saa-Requejo (1,3), Maria Villeta (4), Ana M. Tarquis (1,5)

(1) Dpto de Ingeniería Cartográfica, Geodesia y Fotogrametría. ETSIAAB, UPM, Ciudad Universitaria sn, 28040 Madrid, Spain, , (2) CEIGRAM, Universidad Politecnica de Madrid, Spain (anamaria.tarquis@upm.es), (3) Dpto de Producción Agraria, ETSIAAB, UPM, , (4) Facultad de Estudios Estadísticos, Estadística e Investigación Operativa III, UCM, Madrid, Spain, (5) Grupo de Sistemas Complejos, UPM, Spain.

Spatial variability of soil properties is relevant for identifying those zones with physical degradation. We used descriptive statistics and multifractal analysis for characterizing the spatial patterns of soil penetrometer resistance (PR) distributions and compare them at different soil depths and soil water content to investigate the tillage effect in soil compactation. The study was conducted on an Inceptisol dedicated to olive orchard for the last 70 years. Two parallel transects of 64 m were selected as different soil management plots, conventional tillage (CT) and no tillage (NT). Penetrometer resistance readings were carried out at 50 cm intervals within the first 20 cm of soil depth (López de Herrera et al., 2015a).

Two way ANOVA highlighted that tillage system, soil depth and their interaction are statistically significant to explain the variance of PR data. The comparison of CT and NT results at different depths showed that there are significant differences deeper than 10 cm but not in the first two soil layers. The scaling properties of each PR profile was characterized by $\tau(q)$ function, calculated in the range of moment orders (q) between -5 and +5 taken at 0.5 lag increments. Several parameters were calculated from this to establish different comparisons (López de Herrera et al., 2015b).

While the multifractal analysis characterizes the distribution of a single variable along its spatial support, the joint multifractal analysis can be used to characterize the joint distribution of two or more variables along a common spatial support (Kravchenko et al., 2000; Zeleke and Si, 2004). This type of analysis was performed to study the scaling properties of the joint distribution of PR at different depths. The results showed that this type of analysis added valuable information to describe the spatial arrangement of depth-dependent penetrometer data sets in all the soil layers.

References

Kravchenko AN, Bullock DG, Boast CW (2000) Joint multifractal analysis of crop yield and terrain slope. Agro. j. 92: 1279–1290.

López de Herrera, J., Tomas Herrero Tejedor, Antonio Saa-Requejo and Ana M. Tarquis (2015a) Influence of tillage in soil penetration resistance variability in an olive orchard. Geophysical Research Abstracts, 17, EGU2015-15425.

López de Herrera, J., Tomás Herrero Tejedor, Antonio Saa-Requejo, A.M. Tarquis. Influence of tillage in soil penetration resistance variability in an olive orchard. Soil Research, accepted, 2015b. doi: SR15046

Zeleke TB, Si BC (2004) Scaling properties of topographic indices and crop yield: Multifractal and joint multifractal approaches. Agro. j. 96: 1082–1090.