Geophysical Research Abstracts
Vol. 21, EGU2019-19102, 2019
EGU General Assembly 2019

Scaling heterogeneity of microprofiles of soil penetration resistance under native forest, unmanaged and managed grasslands

Renan Tavanti (), Aitor García-Tomillo (2), Rafael Montanari (1), Marcos Lado (2), and Antonio Paz González (2)

(1) São Paulo State University, Ilha Solteira Campus, São Paulo, Brazil., (2) University of Corunna (UDC). Faculty of Science, A Coruña, Spain.

Soil compaction has been demonstrated to affect root and crop growth, and commonly it is assessed by penetration resistance (PR) tests. High resolution PR microprofiles are used in combination with other soil properties for assessing soil physical quality indices, such as the so called last limiting water range (LLWR). Multifractal analysis of these microprofiles allows characterization of highly localized heterogeneity at the scale of small soil cores of about 4-5 cm length. The objectives of this work were to characterize the scaling properties of PR microprofiles and to explore effects of land use and water potential on multifractal parameters.

The soil studied was classified as a Rhodic Acrustox. Undisturbed soil cores were sampled under native forest (NF) unmanaged grassland (UMG) and managed grassland (MG). For all the three treatments studied, soil cores were slowly rewetted and then they were equilibrated at the following potentials: -30, -60, -100, -300, -600, -1000 and -1500 kPa, using a sand box and a pressure plate. After equilibrium was reached at a given soil potential, two soil PR microprofiles were measured .

Renyi and singularity spectra showed that depth-dependent PR microprofiles exhibited a well-defined multifractal structure. ANOVA analysis showed significant differences ($P<0.05$) in scaling heterogeneity between NF and grassland, but not between UMG and MG; also various multifractal parameters demonstrate interaction between land uses and water potential. Principal component analysis showed association between selected multifractal parameters and soil physical properties used for LLWR evaluation, such as field capacity, wilting point and aeration porosity. Several multifractal parameters also were correlated to PR and other soil properties associated to LLWR.