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Soil structure singularities from 3D images

R. Heck(1), J.M. Antón(2), J.B. Grau(2), J. Fabregat(2), M.E. Sánchez(2), D. Andina(3) and A.M. Tarquis(2,4)

(1) Dept. of Land Resource Science. Ontario Agricultural College, University of Guelph, Canada. (2) Dpto. de Matemática Aplicada a la Ingeniería Agronómica. E.T.S.I.A. Universidad Politécnica de Madrid (U.P.M.), Spain. (3) E.T.S. Ingenieros de Telecomunicación, U.P.M., Spain. (4) CEIGRAM – U.P.M., Spain. (rheck@uoguelph.ca)

Spatial arrangement of soil pores determines soil structure and is important to model soil processes. Geometric properties of individual and interpretation of the morphological parameters of pores can be estimated from thin sections or 3D Computed Tomography images, but there is no satisfactory method to quantify the complexity of their spatial arrangement. The objective of this work was to apply a multifractal technique to quantify properties of the soil pore system.

Intact soil samples were collected from four horizons of an Argisol, formed on the Tertiary Barreiras group of formations in Pernambuco state, Brazil (Itapirema Experimental Station). The natural vegetation of the region is tropical, coastal rainforest. with different porosities and spatial arrangements have been obtained. From each horizon, three adjacent samples were taken having a set of twelve samples. The intact soil samples were imaged using an EVS (now GE Medical. London, Canada) MS-8 MicroCT scanner with 45 μm pixel^{-1} resolution (256x256x256 voxels). Though some samples required paring to fit the 64 mm diameter imaging tubes, field orientation was maintained. Binary 3D images were obtained after thresholding and analyzed to obtain their singularities (α) and $f(\alpha)$ spectra.