



## **Morphological and structural analysis of earthworm burrows A methodological approach by X-ray tomography**

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Earthworms are known to have burrowing activities that affect soil physical properties, generating tubular macro-porosity, galleries. These bioturbation, establishing channels of preferential flow in soil, have a major role in the flow of water through percolation process in the profile or diffusion to the soil matrix.

Our study had the purpose to propose a new approach to understand the descriptive parameters of earthworm burrows (morphological parameters, structural parameters).

5 Different soil volumes are taken from the field. X-ray tomography has been used for studying the 3D soil architecture. This approach allows us to characterize several morphological parameters (total length, volume, pore surface ...) and structural ones (wall gallery density) of galleries extracted from networks, through the X-ray tomography.

The wall has been defined in 3 areas (Z1 Z2 and Z3) as concentric ROI cylinders (region of interest) of constant increasing diameters (5mm) around the burrows. A density was measured in these 3 areas and along the gallery, to describe the evolution of the density around the pore and along the gallery, for the 5 different modalities.

A wide variability of density was observed along the gallery and from the central zone to the soil matrix: The densities in the 3 zones are significantly different one another, whatever the modality considered (Friedman, 0.05). The density of the wall in Z1 evolves according to the pore surface and diameter. The Spearman's rank correlation test allows us to say that the density in Z1 is significantly and negatively correlated to the diameter and the surface of the pore.

Evolution of the density around the pore of the burrow: A growth is noticed in Z1, located between 3 and 8 mm from the center of the pore. Its densities growth from -750Hu to 1100Hu.