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Biological activity impact on the dynamics of aggregates within a Technosol: direct visualization and quantification in a 14 months experimentation

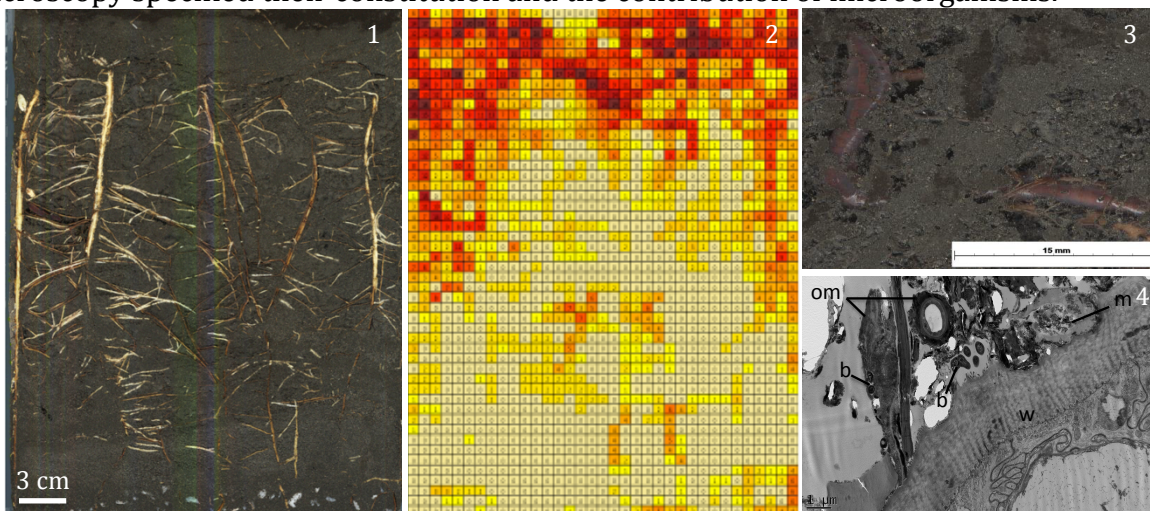
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Evaluate the dynamics of soil structure, particularly under the influence of biological factors is a major challenge in an objective of their pedogenesis modeling. By using an innovative device of automatic acquisition of high-resolution images, SOILINSIGHT[®], we specified in rhizotrons during 14 months the porosity and aggregation dynamics of a constructed Technosol within the rhizosphere of a leguminous plant (*Lupinus albus*) in presence of earthworms (*Lumbricus castaneus*). The constructed Technosol is, by definition, considered as a good candidate for the pedogenesis modeling, insofar as its initial characteristics and implementation conditions are controlled (Séré *et al.*, 2010).

A video can show the dynamics of biological agents: root system architecture from germination to senescence of plants, formation of symbiotic nodules, movements of earthworms within rhizotron... Specific image processings were used to quantify total porosity (50µm-2mm), total area of aggregates (100µm-2mm) and various descriptive parameters of pores or aggregates: number, size, diameter, form index (Jangorzo *et al.*, 2013). "Actions" of worms - digging or filling burrows, crossing - were recorded over time. After 14 months, the pore surface is 10 times higher in rhizotrons with plant and macrofauna in comparison with the controls. If the biological activity promoted the genesis of aggregates, their dynamics was irregular in that the proportion of aggregates increased or decreased depending on the actions of worms. Characterization of bioturbations on soil thin sections or at microaggregation scale by transmission electron microscopy specified their constitution and the contribution of microorganisms.



(1) View of the rhizosphere at the rhizotron surface. (2) Intensity of worm actions at 208 days. (3) Details of the earthworm/soil interface at photonic and (4) electronic scale (caption - b : bacteria ; om : organic matter ; m : mineral ; w : earthworm).

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References

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Séré G, Schwartz C, Ouvrard C, Renat JC, Watteau F, Villemin G, Morel, JL. 2010. Early pedogenetic evolution of constructed Technosols. *Journal of Soils and Sediments*. 10: 1246-1254.