Direct visualization and quantification of the biological activity impact on the dynamics of technosol structure. Protinus, How to unravel the interactions between soil structure and soil functions ?

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Direct visualization and quantification of the biological activity impact on the dynamics of technosol structure

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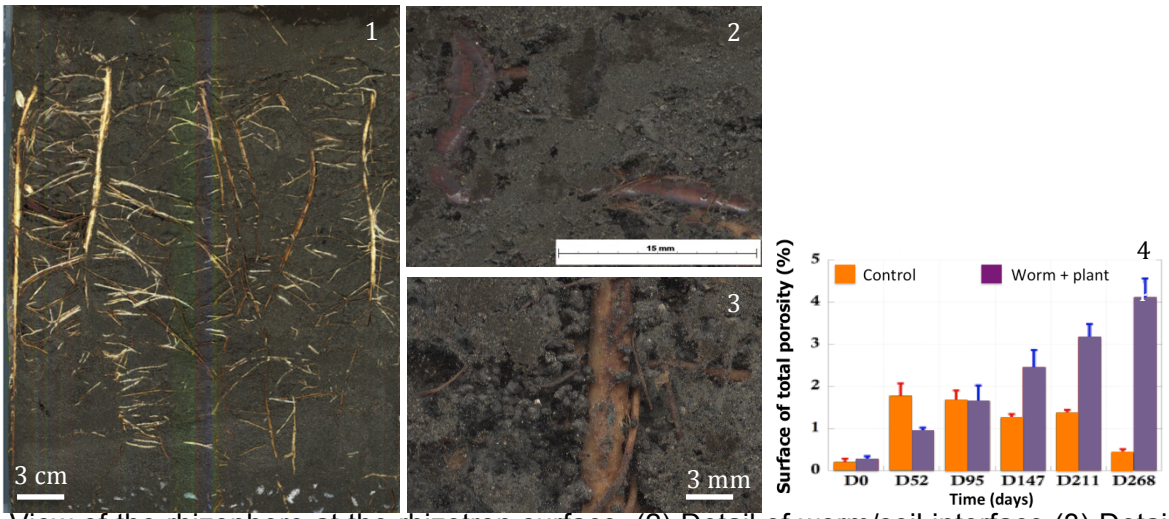
Evaluate the dynamics of soil structure, particularly under the influence of biological factors is a major challenge in an objective of their pedogenesis modeling. By using an innovative device of automatic acquisition of high-resolution images, SOILINSIGHT®, we specified in rhizotrons during 14 months 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.
The used device of non-destructive observation of soil profiles is an innovative way of monitoring and quantifying the impact of pedogenetic factors on the functioning and evolution of soils. Currently we attempt to link these results with data obtained through tomography analysis of the cosmes at the end of the experimentation.



(1) View of the rhizophere at the rhizotron surface. (2) Detail of worm/soil interface (3) Detail of the root/soil interface (4) Quantification of total porosity

References

Jangorzo NS, Watteau F, Schwartz C. 2013. Evolution of the pore structure of Technosols during early pedogenesis quantified by image analysis. *Geoderma*. 207-208: 180-192.
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