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Diversity of soil biopores and their influence on soil water infiltration under various pedoclimatic conditions

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Despite the large contribution of macropores made by soil engineers to the soil macroporosity and water infiltration, few studies have addressed the specific contribution of soil engineer groups, dynamics of biopores and their efficiency in conducting water. Thus, we aimed to investigate the link between soil macrofauna, soil biopores and water infiltration **under different pedoclimatic conditions**. To do so, we conducted an experimentation **in twelve study sites** with a large longitudinal gradient from France to Vietnam. The experiment consisted in the field incubation of repacked soil in cores (15 cm in height and 15 cm in diameter) and controlling the activity of soil engineers in the manner of litter bag. For each site, soil columns were: (i) covered with a mesh (200µm) or not and (ii) with or without addition of organic residues to the soil surface. After 12 months, we measured (i) the 3D organization of biopores by X-ray computed tomography and (ii) the saturated hydraulic conductivity by Beerkan method. In addition, soil macrofauna communities and the 3D organization of biopores was measured in each study field.

Addition of organic residues increased up to 2-fold the volume percentage of biopores which reached similar values than those observed for each study field. The co-inertia analysis between the data matrix characterizing the shape of biopores and the data matrix of the macrofauna communities showed no statistically significant correlation. Saturated hydraulic conductivity increased with the presence of biopores by 2 to 50-fold with the lowest increased in soils presenting largest saturated hydraulic conductivity. In conclusion, these results demonstrated that biopores are rapidly regenerated regardless the pedoclimatic conditions while the efficiency of biopores in conducting water is related to soil properties.

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