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Study on side effects of iron-based amendments on soil structure

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Recent trends in green and sustainable remediation require an increased attention on the environmental side effects. Among them the physical consequences of soil remediation practices on soil structure are very rarely investigated, although such physical property largely influences the soil quality.
The use of in situ elemental immobilization by means iron-based technologies is rapidly developing in contaminated land and groundwater remediation. Iron-rich soil amendments may be applied as part of "assisted natural remediation" schemes at metal/metalloid contaminated sites to immobilize contaminants and then improve vegetation growth and microbial diversity, and reduce offsite metal transport. The current approach is to evaluate the mobility of heavy metals in soil and their translocation to plants rather than to verify also the extent of modifications occurred to some key characteristics of soil structure after the remediation practices.
The aim of this work was to focus on the direct quantification of the effects of iron-rich soil amendments on soil pore system and on the understanding of the underlying physical mechanisms. A laboratory experiment was carried out by adding iron grit to three different soils subjected to several wetting-drying cycles. The physical effects of the treatment on soil pore system were identified and quantified combining soil micromorphology and pore image analysis. The impact of iron grit on soil structure resulted strongly influenced by some soil physical properties. In high shrinkage-swelling soils was observed a porosity increase, more evident in the less plastic soil, while in the very low shrinking-swelling soil the porosity decreased.
The obtained results showed overall the high potential of soil micromorphology and pore image analysis in order to evaluate the environmental impact of soil remediation practices.