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Soil morphometrics applied to soil trenches in a contaminated site

Fabio Terribile, Simona Vingiani, Antonio Mileti, and Giuliano Langella
Università di Napoli Federico II, Department of Agriculture, Portici (Napoli), Italy (fabio.terribile@unina.it)

In many contaminated sites and/or sites affected by a potentially toxic element (PTE) contamination, the spatial variability of soil contamination is a very complex issue.

This is because the history of contamination in a specific industrial site is often lost in time and with very different modifications occurring over time. It is even hidden in the case of illegal waste dumping, for which type, quantity and localization of contaminants are unknown. Thus it is not known in advance (i) the spatial distribution of contamination, (ii) the knowledge about how contaminants have been distributed over and beneath the soil, (iii) how far contaminants have been reworked during the life time of the contaminated site.

Despite these problems, it is self-evident that a detailed knowledge of the natural and the anthropogenic spatial variability of soil contamination and soil properties is of crucial importance in both site characterization and most importantly in site reclamation.

Here we claim that the analysis of soil trenches in combination with pXRF can strongly support the understanding about processes behind soil contaminant distribution and this information can then be used in the following study of contaminated site characterization.

This contribution focuses on how to acquire detailed knowledge of the spatial distribution of contamination in an agricultural area of southern Italy, 6 ha of farmland confiscated by the Italian Judiciary due to past illegal burial of industrial tannery wastes causing potential contamination by Cr, Zn and heavy hydrocarbons (C>12). After indirect geophysical and radiometric (i.e. soil gamma ray emissions) prospections, 8 sites for soil profiles and trenches (10 x 1.7 m wide) digging were identified.

Over these trenches both morphological (i.e. colour, structure, plant roots, etc.) and elemental total content analysis (Olympus p-XRF) were performed. This analysis enable to identify three type of soil contaminant deposition which affected to various degree the Ap, Bw and C horizons of the investigated Silandic Andosol. The highest Cr and Zn content was found in the B horizon, where levels of 25000 ppm were measured in soil-pockets of muddy-grey materials, very likely hosting the original processing residues.