Spatial distribution of dust pollutants in soils of under-canopy areas of selected coniferous an deciduous species – research based on integrated magnetic and geochemical methods.

C.1. POPULAR-SCIENCE SUMMARY OF THE PROJECT

Geophysical methods have been successfully implemented in the environmental research into soils and plants (biomonitoring, mapping of the soil pollutant distribution on the local and regional scales) for several years. Pollutants emitted into the atmosphere by various industry branches (energy production, coloured and ferrous metallurgy) or car traffic and coal-fired home furnaces contain iron minerals with specific magnetic properties (ferromagnetic minerals *in sensu lato*). Besides iron, fine particles with diameters between a few and several micrometres contain heavy metals. They are known as technogenic magnetic particles (TMPs). Tree-covered areas capture, from atmosphere, larger amounts of pollutants than the open ones. Nonetheless, plants (trees and bushes) make a temporary reservoir of the dust pollutants that are finally deposited in increased concentrations on the soil surface.

The main project objective is to investigate the differences in how selected tree species (coniferous and deciduous ones) distribute the dust pollutants into the under-canopy area topsoils. Within the project framework, geophysical measurements (i.a. magnetic susceptibility, frequency dependence, thermomagnetic analyses) and physicochemical analyses of soils (i.a. heavy metal contents, granulometry, pH, iron form determinations, organic carbon and nitrogen contents, sorption capacity) will be conducted. The soil sampling will be conducted in dense measurement grids located in singular under-canopy areas for the selected tree species. The complementarity of the assumed methodology will help to investigate the spatial variability in the magnetic particle distribution in the horizontal and vertical modes with consideration for the natural occurrence of iron minerals in the soil (mainly in the enrichment horizons).

The detailed research into the under-canopy area soils based on the magnetic methods has not been conducted in such a broad scope before. The research will simultaneously take into account the influence of particular tree species (throughfall and stemflow effects) and natural variability in the occurrence of the iron minerals in the soils on a meso-scale.

Understanding the spatial variability range in the investigated properties will be based on geophysical methods. It will enable the researchers to use the soil magnetometry on a larger scale in order to assess the tree influence on the pollutant transport and accumulation. Undoubtedly, the proposed magnetic methods have the advantage of presenting the investigated phenomena in the 3-D mode, which will be based on the soil material collected in such a way as to maintain its natural structure and soil horizon sequence. Thanks to the obtained information on the soil properties in the under-canopy area of a singular tree of a given species, it will be possible to present the full picture of the variability in the investigated properties related to the natural (tree species, humus and soil types) and anthropogenic (pollutant transport, heavy metal concentrations, mechanical soil transformations) factors. Results of the study will find application in forestry, environmental protection, soil science or urban greenery management.