Geophysical Research Abstracts
Vol. 13, EGU2011-7306, 2011
EGU General Assembly 2011

Magnetic susceptibility enhancement in soils of urban parks of Upper Silesia region (Poland) as pollution indicator

Adam Lukasik, Zygmunt Strzyszcz, and Marcin Szuszkiewicz
Institute of Environmental Engineering Polish Academy of Sciences, Zabrze, Poland (adamlukasik@ipis.zabrze.pl)

Area of urban parks, covered by vegetation (trees, scrubs) besides recreation function, act as reservoir of air pollution that are finally deposited on soil surface. Moreover, soils of urban parks feature transformation of horizon arrangement, structure and physical, chemical properties as result of human activity. Consequently transformations affected upper and deeper layer of soils. Main reason of magnetic susceptibility enhancement in soil uppermost horizons is deposition of technogenic dusts of various origin (power plants, steelworks, cocking plants, cement plants) and urban dusts related to transport and domestic heating systems. All mentioned above dusts contain ferromagnetics that increase magnetic susceptibility. Soil contaminations and magnetic anomalies, observed in subsoils are related to direct activity of human e.g. construction work, infrastructure development. Magnetic components (magnetite, maghemite, pyrothite) of industrial dusts are accompanied by heavy metals (Pb, Zn, Cd, Mn). Former and recent researches, indicate high correlation coefficients between magnetic susceptibility enhancement in soils and heavy metals content. Studies conducted in soils of urban parks proved that relations.
Measurements of volume magnetic susceptibility (κ) have been done in four urban parks with application MS2D Bartington loop sensor in various arrangement of field points (transect, grid), in A horizons both in open areas and under tree canopies. Additional in areas of high magnetic susceptibility values, soil cores has been taken (30 cm depth) for laboratory measurements of (κ) using MS2C Bartington sensor. Those sampling allow for statement of magnetic anomalies in deeper layers. In laboratory, specific magnetic susceptibility (χ) was measured and then heavy metal contents (aqua regia extraction, ASA determination) in A horizon. On the basis of field measurements, maps of magnetic susceptibility distribution (SURFER 8) have been done for each urban park.
Magnetic susceptibility enhancement in topsoil of urban parks determined both character of dusts (origin, total deposition) and nature of park (distance to emitters, species content of trees). Measurements of soil cores has complemented surface measurements and shows, that locally, artefacts present in soil profile, besides dust fall, had influence on magnetic susceptibility enhancement in subsoil horizons. High values of magnetic susceptibility accompanied elevated heavy metal contents. Correlation coefficients between magnetic susceptibility and heavy metal content in A horizons of urban park soils for Pb, Cd, Zn and Mn, exceeded 0.8. Presence of ferromagnetics in industrial, urban dusts and in human made materials found in soils, allows for application of magnetic susceptibility as parameter linked to contamination and transformation of topsoils.