Geophysical Research Abstracts, Vol. 8, 05206, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05206
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Establishing metal contents in soils of Wallonia, Belgium: the influence of parent material, soil type, land use, profile development and atmospheric deposition.

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This study aims at establishing the usual content in metal trace elements (MTE) in the soils of Wallonia, a 17,000 sq. km region which covers the southern half of Belgium. The survey was commissioned by the government of the Walloon Region and focused mainly on As, Cd, Co, Cr, Cu, Hg, Ni, Pb and Zn.

One hundred and sixty-one sampling locations were determined based on the 1:20,000 soil map of Belgium, which not only provides information about soil type but also about geology. Each sampling site was selected to best represent the most frequent combinations of soil category, geological parent material and land use and also to have a uniform sample density. The sampling sites also explored three types of land use: arable land, pasture and forest. A 15-km radius exclusion zone was drawn around all past and present known sources of air-borne particles such as roads, urban areas and industries. One surface and two subsurface samples (max depth of 130 cm) were taken from an undisturbed soil core obtained using a tool pushed downward in the ground by a hydraulically powered percussion hammer.

MTE were analyzed using ICP-AES analysis on aqua regia extracting solutions. Basic soil characterization (pedological parameters) included determination of pH, particle size, cation exchange capacity (CEC), total nitrogen, total iron and organic carbon.

Statistical analysis and mapping using multivariate geostatistical techniques show that MTE contents are influenced by the pedological parameters of the soil, the sample depth in the profile, the land use and the distance from disused base metal metallurgical plants. Hg and Pb concentrations are closely related to the soil organic carbon

content, which itself is determined by the land use, while the concentrations of the other studied elements (As, Co, Cr, Cu, Ni, Zn) tend to be correlated mainly with Fe and clay contents and are most likely the result of pedological processes. Cd varies independently from the pedological parameters and from the other ETM. It exhibits a strong spatial continuity which clearly results from small to medium-range atmospheric deposition processes.