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Comparison on humus and soil geochemical baselines in Southern Finland

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Humus has been recognized since a survey in 1977 (Allen and Steinnes, 1980) as one of the best sampling media for mapping regional environmental contamination because of the strong geochemical contrast between anomalous and background concentrations resulting from its capacity to accumulate high levels of trace metals.
This study is in the framework of the comparison between humus, topsoil and moss deposition data, in order to analyze the humus behavior and to find possible similarities to underlying geology and long-range atmospheric deposition. The analyzed samples are part of a geochemical mapping programme carried out by the Geological Survey of Finland (GTK); subsoil, topsoil and humus samples have been collected in a large area in Southern Finland since 2002.
816 sample pairs (humus and topsoil samples) were selected for statistical analysis. Statistical graphs, like histograms, CP plots and box plots, were realized for 31 elements, and showed that most of the elements have completely different distribution of concentrations in humus and in topsoil samples. Then the correlation between the element concentrations in humus and minerogenic topsoil has been evaluated measuring the Spearman rank correlation value and elaborating scatter plots between the element concentrations in humus and minerogenic topsoil, and between the content of the element vs. the content of organic C.
The concentrations of some elements, like K, Mg, Fe, Al, in humus samples are controlled by the content of mineral matter, derived by the soil dust. Other elements, such as As, Bi, Cd, Co, Cu, Mn, Mo, Ni, Pb, Rb, Th, V and Zn showed evident outliers, with probable anthropogenic origin. In order to explain these anomalous high values in humus, the geographic distributions of these elements in humus and topsoil were analyzed and then compared to the deposition data obtained by the national moss data. High values appear in areas where the anthropogenic impact is strong, like the Harjavalta area, where older emissions from the smelter still cause anomaly patterns in some elements, and the more densely populated and industrialized areas, like the city of Tampere and the coastline from Porvoo to the capital region of Helsinki.
According to the results presented here, the humus concentrations are more affected by the atmospheric impact than by the lithogenic contributes. Because of the great anthropogenic influence on humus concentrations, that causes locally high anomalies, even after many years, new humus samples should be collected, in order to improve the knowledge about humus behavior and anthropogenic input to the topmost layer of ground surface.

REFERENCES

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