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Modelling plant uptake of Cd, Ni and Pb from mobile fractions and release rates obtained by the EUF-method

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In order to predict concentrations in green plants from kinetic data as well as from mobile soil fractions from geogenically enriched areas, soils from historic mining and smelting sites in Styria (Austria) were used to grow lettuce in pot experiments. Lettuce is known for high accumulation of Ni and Cd in the shoots as well, but in our case, uptakes remained low. Addition of a mixed metal salt solution resulted in high Ni concentrations in the plants, contrary to Cd and Pb. Effects of mineral fertilizers and metal salt additions upon plant metal uptake and N resp C/N shifts were monitored and combined with results from batch-extraction as well as with release rates and released amounts obtained by a modified EUF (electro-ultra-filtration) method.

The release obtained by EUF in 0,002M DTPA was modelled by linear, logarithmic, parabolic (√) and quadratic dependence versus time, from original as well as from cumulated datasets. As expected, addition of soluble salts increased the release, whereas addition of PK fertilizer lowered the release of the metals from soil. Thus, food contamination hazards can be lowered by adequate agricultural activities. Plant uptake by nickel got clearly enhanced by metal salt additions, whereas effects of added cadmium and lead were lower. Correlations between plant uptake and release rates resp. released amounts were in the same range, whatever model was used.