Geophysical Research Abstracts
Vol. 16, EGU2014-6528, 2014
EGU General Assembly 2014


# GEMAS: a new view of the lead isotopic soil landscape at the European continental scale

Clemens Reimann (1), Philippe Négrel (2), Belinda Flem (1), Karl Fabian (1), Manfred Birke (3), Anna Ladenberger (4), and Jurian Hoogewerff (5)

(1) Geological Survey of Norway (NGU), PO Box 6315, Sluppen, N-7491 Trondheim, Norway, (2) BRGM, Laboratories Division, 3 Avenue Claude Guillemin, BP 6009, 45060 Orléans Cedex 2, France, (3) Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Postfach 510153, D-30631 Hannover, Germany, (4) Geological Survey of Sweden (SGU), Box 670, S-751 28 Uppsala, Sweden, (5) Dept. of Chemistry, Univ. of Otago, P.O. Box 56, Dunedin 9016, New Zealand

Soil formation through weathering of bedrock and sediments is an extremely slow process, and soils must be considered an essential and non-renewable resource. Knowledge and extrapolation of threats to soils, e.g., changes in element concentrations and the reasons thereof are of primary importance for society as recently diffuse contamination has been identified as one of the major threats to soil quality. In this frame the addition of isotope tracing at the continental scale is an important supplementary constraint on the origin and behaviour of elements in soils.

Lead has been mined and utilized by humans for several thousand years. The accumulated world production is estimated to be over 300 Mt. Detailed studies on environmental samples (e.g., peat bogs, ice cores, sediment cores) suggest a major Pb contamination of the northern hemisphere since ancient times. In spite of its importance the continental scale distribution of lead and lead isotopes combined has never been documented for any geochemical sample material.

As the result of a combined effort of the European Geological Surveys, backed by the European metals industry, we present the first continental investigation of Pb concentration and Pb isotope ratios (206Pb,207Pb, 208Pb) landscape using agricultural soil samples (Ap-horizon, 0-20 cm) collected at an average density of 1 site/2500 km2 (2211 samples in total).

Thus we here provide the first geochemical reference maps of Pb concentrations combined with Pb isotope ratios at the European scale against which the impact of contamination can be realistically judged. The maps localize the major concentration anomalies of Pb in soils and help to identify the processes that generate the observed distribution patterns. The European continental-scale patterns of Pb concentrations and Pb isotopes show a high variability dominated by geology and influenced by climate. Positive Pb concentration anomalies mark most of the known mineralized areas throughout Europe. Some few rather local Pb anomalies on the map have a distinct anthropogenic origin.