Geophysical Research Abstracts
Vol. 16, EGU2014-6089, 2014
EGU General Assembly 2014

GEMAS: Geochemical Mapping of the agricultural and grasing land soils of Europe

Clemens Reimann (1), Manfred Birke (2), Alecos Demetriades (3), Peter Filzmoser (4), and Patrick O'Connor (5)

(1) Clemens Reimann, Geological Survey of Norway, Trondheim, Norway, clemens.reimann@ngu.no, (2) Manfred Birke, Federal Institute for Geosciences and Natural Resources, Hannover, Germany, Manfred.Birke@bgr.de, (3) Alecos Demetriades, Institute for Geology and Mineral Exploration, Acharnae, Greece, alecos.demetriades@gmail.com, (4) Peter Filzmoser, Department of Statistics and Probability Theory, Vienna University of Technology, Vienna, Austria, P.Filzmoser@tuwien.ac.at, (5) Patrick O'Connor, GeologicalSurvey of Ireland, Dublin, Ireland, pjoconnor30@gmail.com

Geochemical Mapping of Agricultural and grazing land Soil (GEMAS) is a cooperative project between the Geochemistry Expert Group of EuroGeoSurveys and Eurometaux. During 2008 and until early 2009, a total of 2108 samples of agricultural (ploughed land, 0-20 cm, Ap-samples) and 2023 samples of grazing land (0-10 cm, Gr samples) soil were collected at a density of 1 site/2500 km2 each from 33 European countries, covering an area of 5,600,000 km2. All samples were analysed for 52 chemical elements following an aqua regia extraction, 41 elements by XRF (total), and soil properties, like CEC, TOC, pH (CaCl2), following tight external quality control procedures. In addition, the Ap soil samples were analysed for 57 elements in a mobile metal ion (MMI®) extraction, Pb isotopes and magnetic susceptibility.
The results demonstrate that robust geochemical maps of Europe can be constructed based on low density sampling. The two independent sample materials, Ap and Gr, show very comparable distribution patterns across Europe. At the European scale, element distribution patterns are governed by natural processes, most often a combination of geology and climate. The geochemical maps reflect most of the known metal mining districts in Europe. In addition, a number of new anomalies emerge that may indicate mineral potential. The size of some anomalies is such that they can only be detected when mapping at the continental scale. For some elements completely new geological settings are detected. An anthropogenic impact at a much more local scale is discernible in the immediate vicinity of some major European cities (e.g., London, Paris) and some metal smelters. The impact of agriculture is visible for Cu (vineyard soil) and for some additional elements only in the mobile metal ion (MMI®) extraction. For several trace elements, deficiency issues are a larger threat to plant, animal, and finally human health at the European scale than toxicity. Taking the famous step back to see the whole picture at the continental scale, and to understand the relative importance of the processes leading to element enrichment/depletion in soil, may hold unexpected promise for mineral exploration as well as for environmental sciences.