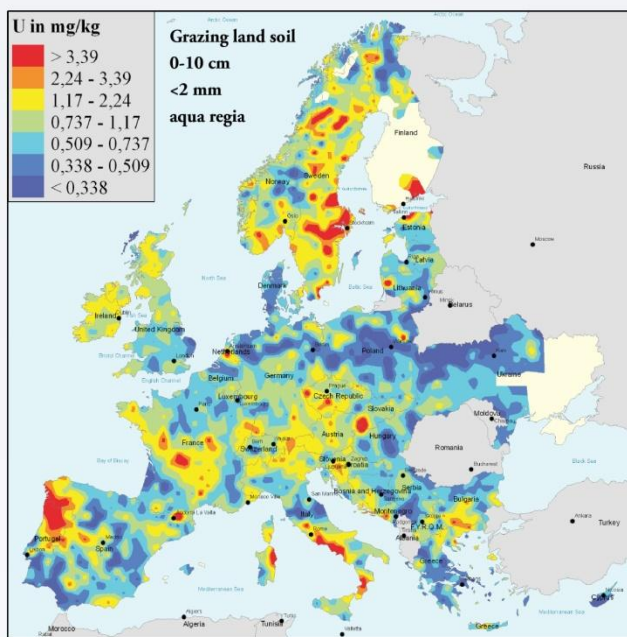
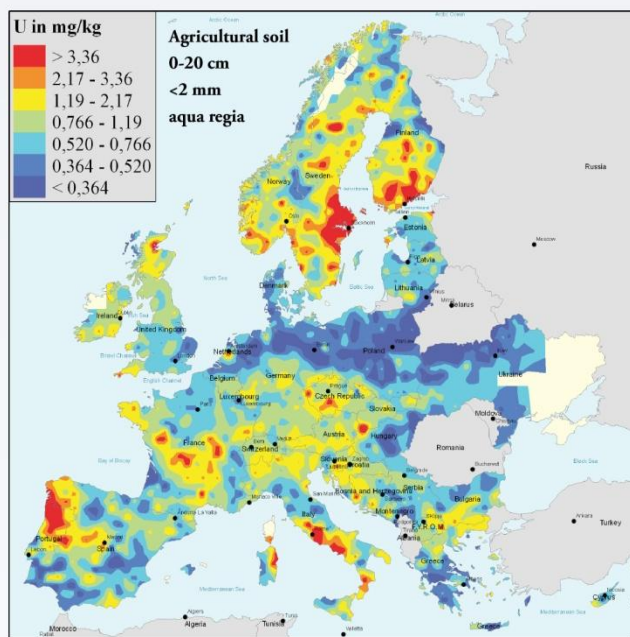


GEMAS

Geochemical Mapping of Agricultural and Grazing Land Soil

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Site 107, Norway. Independent expert quality control



Site 97, Norway, agricultural soil (A)



Site 96, Norway, grazing land (Gr)

The administration of REACH requires reliable, harmonized information on soil quality at the European scale.

The GEMAS project will deliver comparable data on metals in agricultural and grazing land soil, in addition to soil properties known to influence the bioavailability and toxicity of metals.

2211 samples of agricultural soil (0-20 cm) and 2118 samples of grazing land soil (0-10 cm) were collected in 2008 at an average sample density of 1 site/2500 km².

The analytical programme is extensive: >50 elements in an aqua regia extraction, >40 elements by XRF, CEC, TOC, C_{tot}, S_{tot}, pH_{CaCl2}, grain size, k_D values for selected metals, MIR, Pb isotopes, Sr isotopes: always measured in one laboratory only. The aim is to produce one of the best harmonized and directly comparable datasets on soil quality and metals in soils that exists at the EU scale.

GEMAS is a cooperation project between EuroGeo-Surveys and Eurometaux.

The GEMAS project started in 2008 with a joint field campaign of almost all geological surveys in Europe in cooperation with some external organizations (e.g. Alterra in The Netherlands, several universities and the Norwegian Forest and Landscape Institute). The total area covered is over 5 million km². During a field training course in March 2008 the sampling protocol was tested and finalized. The field handbook for the GEMAS project can be downloaded from the internet at the following website: <http://www.ngu.no/no/hm/Publikasjoner/Rapporter/2008/2008-038>

A description of the project and quality control results for the aqua regia analyses are provided in: Reimann, C., Demetriades, A., Eggen, O.A., Filzmoser, P. and the EuroGeoSurveys Geochemistry Expert Group, 2009. **The EuroGeoSurveys geochemical mapping of agricultural and grazing land soils project (GEMAS) - Evaluation of quality control results of aqua regia extraction analysis. NGU Rapport 2009.049.** This report can be downloaded from the internet at: <http://www.ngu.no/no/hm/Publikasjoner/Rapporter/2009/2009-049/>

All samples were collected using the same sampling protocol and equipment (e.g. all sample bags purchased from just one central source). All samples were prepared (air dried and sieved to <2 mm using nylon screening) in just one laboratory. Analyses are partly carried out by geological survey laboratories as a contribution to the project and partly as paid contract work (Eurometaux funding) by external laboratories. Another part of the work (MIR and K_d-values) is carried out in the form of a paid research contract by CSIRO Land and Water in Adelaide, Australia.

The analytical programme for the project is extensive:

- (1) pH (CaCl₂), Total organic Carbon (TOC), Total Carbon, Loss on Ignition (LOI), Total Sulphur, Cation Exchange Capacity (CEC, silver thiourea method) for all samples and grain size for 800 samples of the Ap and the Gr sample sets.
- (2) Aqua regia extraction on 15 g aliquots and analysis of: Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Ge, Hf, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Pd, Pt, Rb, Re, S, Sb, Sc, Se, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Y, Zn, and Zr.
- (3) Total element concentrations (XRF): SiO₂, TiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, CaO, Na₂O, K₂O, P₂O₅, SO₃, Cl, F, As, Ba, Bi, Ce, Co, Cr, Cs, Cu, Ga, Hf, La, Mo, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, Ta, Th, U, V, W, Y, Zn, and Zr.
- (4) Pb isotopes (Ap samples), Sr isotopes (Gr samples), and possibly Li isotopes.
- (5) K_d values for the following elements: Ag, B, Co, Cu, Mo, Mn, Ni, Pb, Sb, Se, Sn, Te, V, and Zn.
- (6) MIR spectroscopy – the data will be used to build models for the prediction of a variety of soil properties (e.g. grain size for all samples).

The data will be used by the Eurometaux metals consortia to prepare the REACH dossiers for those elements which have led to a financial contribution to the project. EuroGeoSurveys will use all the data to prepare a "Geochemical Atlas of Agricultural and Grazing Land Soil of Western Europe". In 2013 the data will be released, together with the atlas, to the general public.

For further information, or in case you are interested to participate in and contribute to the project:

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