

**2012 ANNUAL REPORT FOR THE
INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)/
INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY (IAGC) TASK GROUP ON
GLOBAL GEOCHEMICAL BASELINES**

URL: <http://www.globalgeochemicalbaselines.eu/>

1. TITLE OF CONSTITUENT BODY

IUGS/IAGC Task Group on Global Geochemical Baselines.

2. OVERALL OBJECTIVES

The mission of the IUGS/IAGC Task Group on Global Geochemical Baselines is (i) to prepare a global geochemical database, and its representation in map form, and (ii) to document the concentration and distribution of chemical elements and species in the Earth's near-surface environment. This database is urgently needed by environmental and resource managers throughout the world. To reach this goal, the Task Group promotes and facilitates the implementation of harmonised sampling, sample preparation, quality control, and analytical protocols in geochemical mapping programmes. Task Group activities include the following:

- Developing partnerships with countries conducting broad-scale geochemical mapping studies;
- Providing consultation and training in the form of workshops and short courses;
- Organising periodic international symposia and conferences to foster communication among the geochemical mapping community;
- Developing criteria for certifying those projects that are acceptable for inclusion in a global database;
- Acting as a repository for data collected by projects meeting the standards of harmonisation;
- Preparing complete metadata for the various certified projects; and ultimately
- Preparing a global geochemical database and atlas.

3. FIT WITHIN IUGS SCIENCE POLICY

Current IUGS scientific policy objectives relate to global earth science issues, such as identification of mineral resources, global change, geological hazards, environmental geology and sustainable development. The work of the Global Geochemical Baselines Task Group relates directly to all of these objectives through the establishment of a land-surface global geochemical reference network, providing multi-media, multi-element baseline data for a wide variety of environmental and resource applications. The project is also consistent with the strategic plan published by the IUGS Strategic Planning Committee (2000), and the International Year of Planet Earth (2005-2009) of 'Earth Sciences for Society'.

4. ORGANISATION

The project is led by a Steering Committee, which co-ordinates the activities of five Technical Committees and contributions made by regional representatives.

Steering Committee

<i>Co-Leaders</i>	Dr David Smith	US Geological Survey
	Dr Xueqiu Wang	IGGE, China
<i>Scientific Secretary</i>	Mr Shaun Reeder	United Kingdom
<i>Treasurer</i>	Mr Alecos Demetriades	Hellas

Analytical Committee

Chair Ms Gwendy Hall Canada

Co-ordinates the work plan for the analysis of GRN samples, the activities of the laboratories, and the supervision of analytical quality control data.

Sampling Committee

Chair Mr Alecos Demetriades Hellas

Supervises development and co-ordination of sampling protocols in the various climatic and geomorphic provinces throughout the world.

Data Management Committee

Chair Dr Timo Tarvainen Finland

Supervises sampling strategy, co-ordinates the sampling progress of the participating countries, manages the database of sample information and analytical results.

Public Relations and Finance Committee

Chair Mr Alecos Demetriades Hellas

Advertises and promotes the aims, objectives and achievements of the project world-wide, including by use of the World Wide Web, and takes responsibility for trying to secure funding for the project.

Regional RepresentativesSouth America:

Gloria Prieto; INGEOMINAS, Bogotá, Colombia

Carlos Alberto Lins; CPRM - Geological Survey of Brazil; Recife - PE, Brazil

João H. Larizzatti; CPRM – Geological Survey of Brazil; Rio de Janeiro, Brazil

Africa

Theo Davies; University of Venda; Limpopo Province, South Africa

Marthinus Cloete and J.H. Elsenbroek; Council for Geoscience;

Pretoria, South Africa

Keith Sheppard, World Agroforestry Centre (ICRAF), Nairobi, Kenya

Alhaji Lamin Turay, Geological Survey Department Ministry of

Mineral Resources, Sierra Leone

Indian subcontinent:

Pradip Govil; National Geophysical Research Institute; Hyderabad, India

Mathew Joseph, Geological Survey of India; Kerala, India

Ashvin Wickramasooriya; South Eastern University of Sri Lanka; Sammanthurai, Sri Lanka

China:

Xueqiu Wang, Institute of Geophysical and Geochemical Exploration, Langfang, China

Australia:

Patrice de Caritat, Geoscience Australia, Canberra

Japan:

Atsuyuki Ohta, Geological Survey of Japan, AIST, Tsukuba

Europe:

Clemens Reimann, Geological Survey of Norway, Trondheim, Norway

North America:

David Smith, United States Geological Survey, Denver, USA

Francisco Moreira Rivera, Servicio Geológico Mexicano, San Luis Potosí, SLP, Mexico

Andy Rencz, Geological Survey of Canada, Ottawa

5. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS and IAGC

The project does not have any other source of direct funding. However, many National Geological Surveys, and related institutes, have provided significant funds towards national- to continental-scale geochemical mapping projects in support of the Task Group's activities.

Within Europe, 26 National Geological Surveys, and associated institutes and universities, have provided staff time and support to the project to complete the preparation and updating of the European GRN as part of the FOREGS/EuroGeoSurveys programme as an input to the IUGS/IAGC Global Geochemical Baselines project [<http://weppi.gtk.fi/publ/foregsatlas/>]. A very conservative estimate of the cost for the production of the *Geochemical Atlas of Europe* is of the order of 5 million Euro (~7 million USD). A conservative estimate of the Geochemical Mapping of Agricultural and Grazing land soil in Europe (a follow-up of the Geochemical Atlas of Europe) reached the sum of 930,000 Euro (~1 million USD) for just the field sampling; sample preparation and analytical costs exceed 2 million Euro (>2.5 million USD). The Cyprus Geological Survey Department recently carried out a fairly detailed soil geochemical project according to the specifications of the Global project. The cost of this project was in the order of 800,000 Euro (~1 million USD).

From 2007–2012, the USGS has provided funding of approximately 6 million USD for sampling, chemical/mineralogical analyses, and staff salaries for the soil geochemical survey of the conterminous United States. The cost of the National Geochemical Survey of Australia that was completed in 2011 reached A\$ 1,900,000 (~2 million USD). This amount covered only the fieldwork, equipment, materials and external lab analyses, but does not include in-house XRF and ICP-MS analyses and salaries. The geochemical mapping of two GTN cells in Nigeria from 2009 to 2011 cost about GBP 2,000,000 (~3 million USD).

A recent training course on Geochemical Mapping and Environmental Geochemical Survey for African Countries that took place in Beijing in 2011 cost approximately 600,000 Chinese Yuan (~95,000 USD). The course was sponsored by the Ministry of Commerce of the People's Republic of China. The CGS-CCOP-IUGS/IAGC Seminar on CCOP Geochemical Mapping that took place 28 to 29 March 2012 in Nanjing, China, cost 400,000 Chinese Yuan (approx. 64,000 USD).

6. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

This project is closely associated with the work of the EuroGeoSurveys Geochemistry Expert Group (previously the Forum of European Geological Surveys, FOREGS Geochemistry Expert Group). The project also has links with the International Atomic Energy Agency (IAEA) and potential links with GTOS, the Global Terrestrial Observing System. The EGS Geochemistry Expert Group has also established closer links with the European Soil Bureau over the past few years, and was actively involved in the European Commission's 'Soil Thematic Strategy Group' for the preparation of the EU's Soil Protection Document, and the final draft of the pending Soil Protection Directive. The EuroGeoSurveys Secretary General has established links to other European Commission projects, such as the GMES Forum (Global Monitoring of Environment and Security), and INSPIRE (Infrastructure for Spatial Information in Europe), since the Geochemical Atlas of Europe has been produced in a harmonised manner, according to IGCP 259 specifications (Darnley *et al.*, 1995) and, therefore, according to INSPIRE specifications. In North America, the project has established links with the North American Soil Geochemical

Landscapes Project involving the Geological Survey of Canada (GSC), the United States Geological Survey (USGS), and the Servicio Geológico Mexicano (SGM). The Task Group also interfaces with the National Geochemical Survey of Australia.

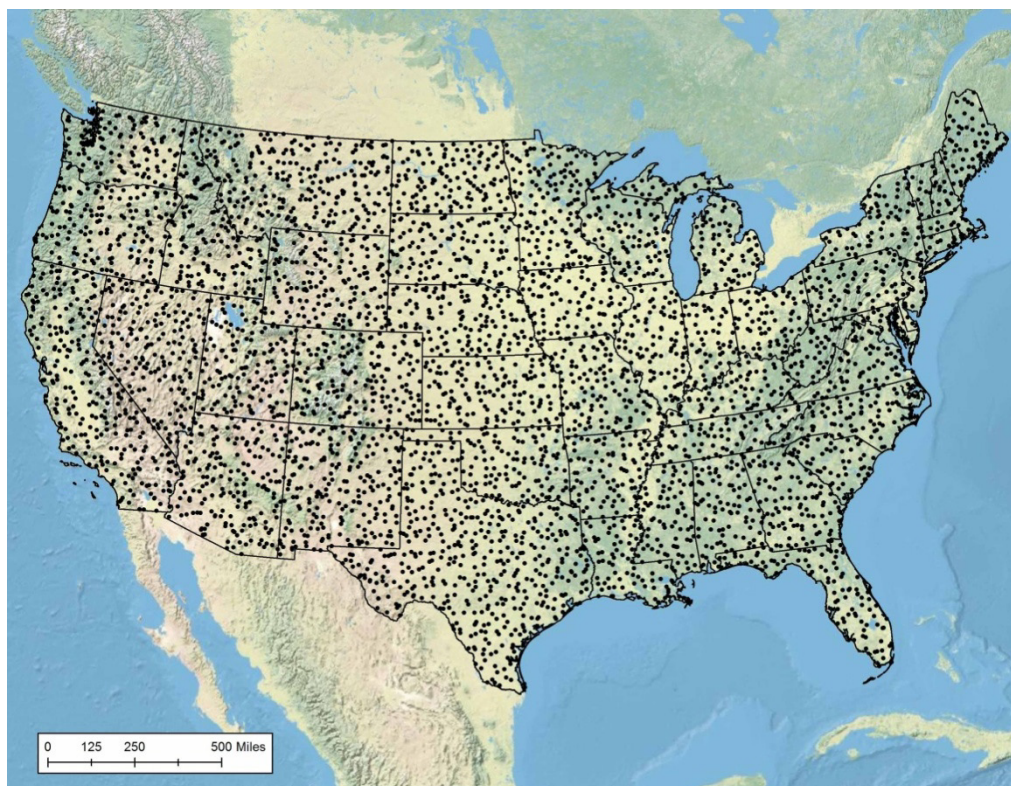
7. CHIEF ACCOMPLISHMENTS IN 2012

Scientific Accomplishments

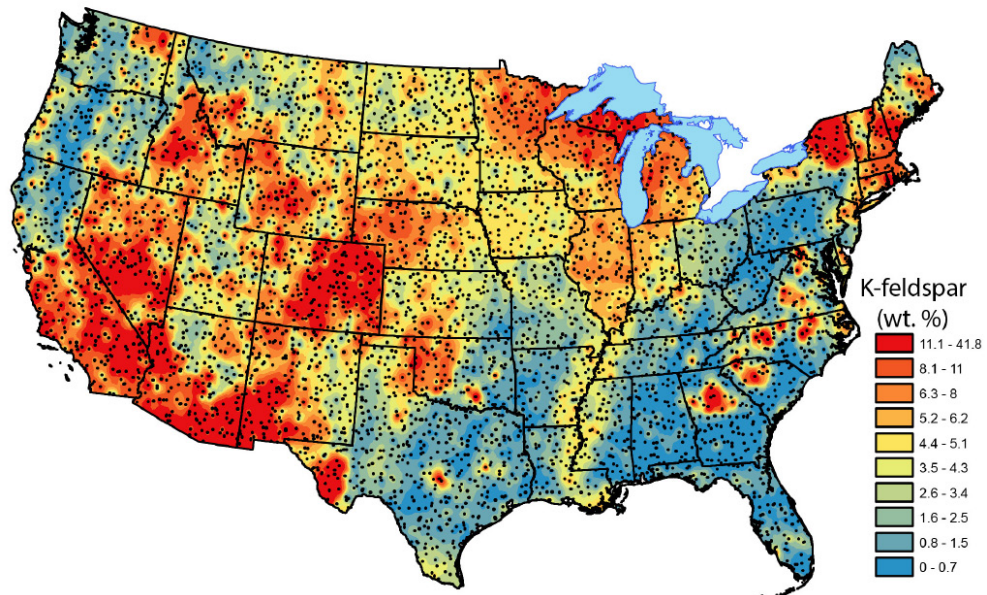
There has been continued and significant progress in a number of areas during 2012, including:

North America (David B Smith, USGS; Francisco Moreira Rivera, SGM)

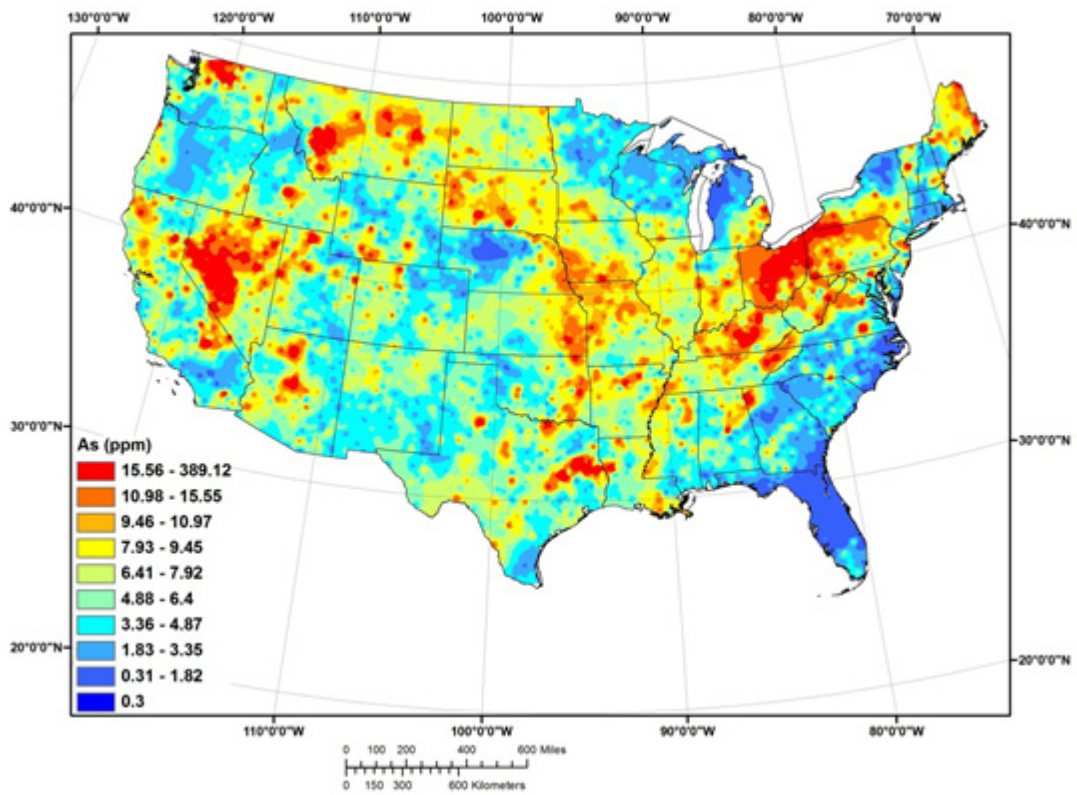
The collaboration between the U.S. Geological Survey (USGS) and the Servicio Geológico Mexicano (SGM) for geochemical mapping of soils in the US and Mexico continues. In 2012, geochemical analyses of more than 14,400 samples and quantitative mineralogical analyses for about 9,600 samples for the US were completed. In Mexico, sampling was completed in 2012. This sampling represents 1,273 40 km x 40 km subcells of the Global Geochemical Reference Network and 3,613 samples. Chemical and mineralogical analyses are currently underway and should be completed by the end of 2013. A summary of the project was published in *Earth Science Frontiers* in 2012 (see Section 9 for the complete reference.)



Map showing the location of 4,841 soil sampling sites, representing 14,439 samples, in the conterminous United States



Map showing the distribution of potassium feldspar in the soil C horizon of the conterminous United States



Map showing arsenic distribution in the soil C horizon of the conterminous United States

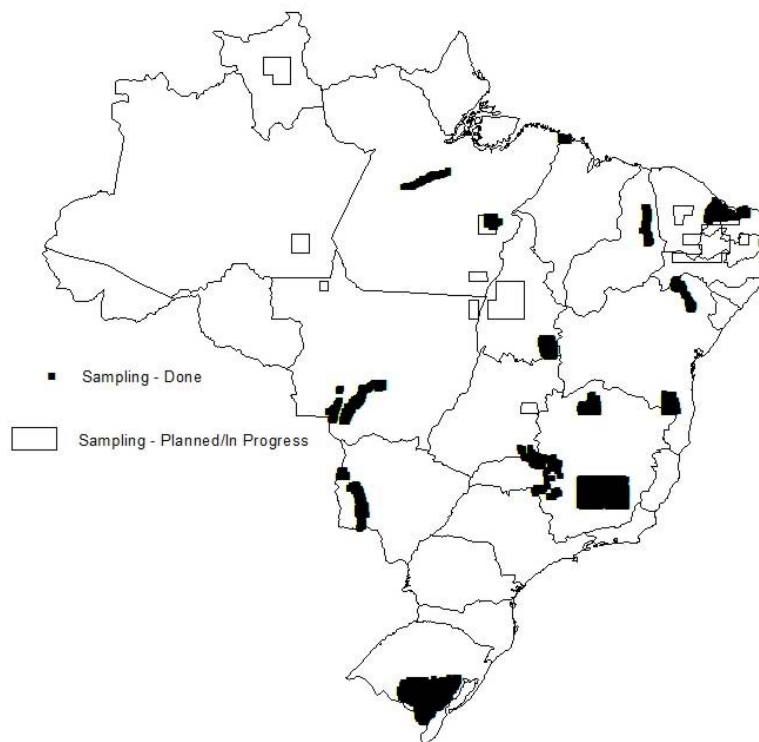
Brazil (João Larizzatti, Geological Survey of Brazil, Rio de Janeiro)

In 2012, the Geological Survey of Brazil (CPRM/SGB) celebrated its 43rd anniversary. Since the 1970s, geochemists from CPRM/SGB have been working in different regions of the country. Our geochemical mapping projects are focused on finding favourable areas for the occurrence of mineral deposits and monitoring the environment, based on systematic regional surveys.

During 2012, systematic geochemical surveys were conducted in Minas Gerais, Mato Grosso do Sul, Mato Grosso, Bahia, Goiás, Tocantins, Pará, Maranhão, Piauí, Ceará, Rio Grande do Norte and Paraíba, in an area of more than 400,000 km². More than 1,300 soil samples, 3,900 stream-sediment samples and 3,000 water samples were collected. Special national exploration projects (for phosphate, REE, diamonds, base and precious metals) are supported by systematic geochemical mapping surveys. The geochemical mapping of the Quadrilátero Ferrífero region was finished and will soon be published. Geochemical data from the Rio Grande do Sul Shield are being analysed. Geochemical sampling is being conducted in the Carajás region with the collection of stream sediments and soil samples.

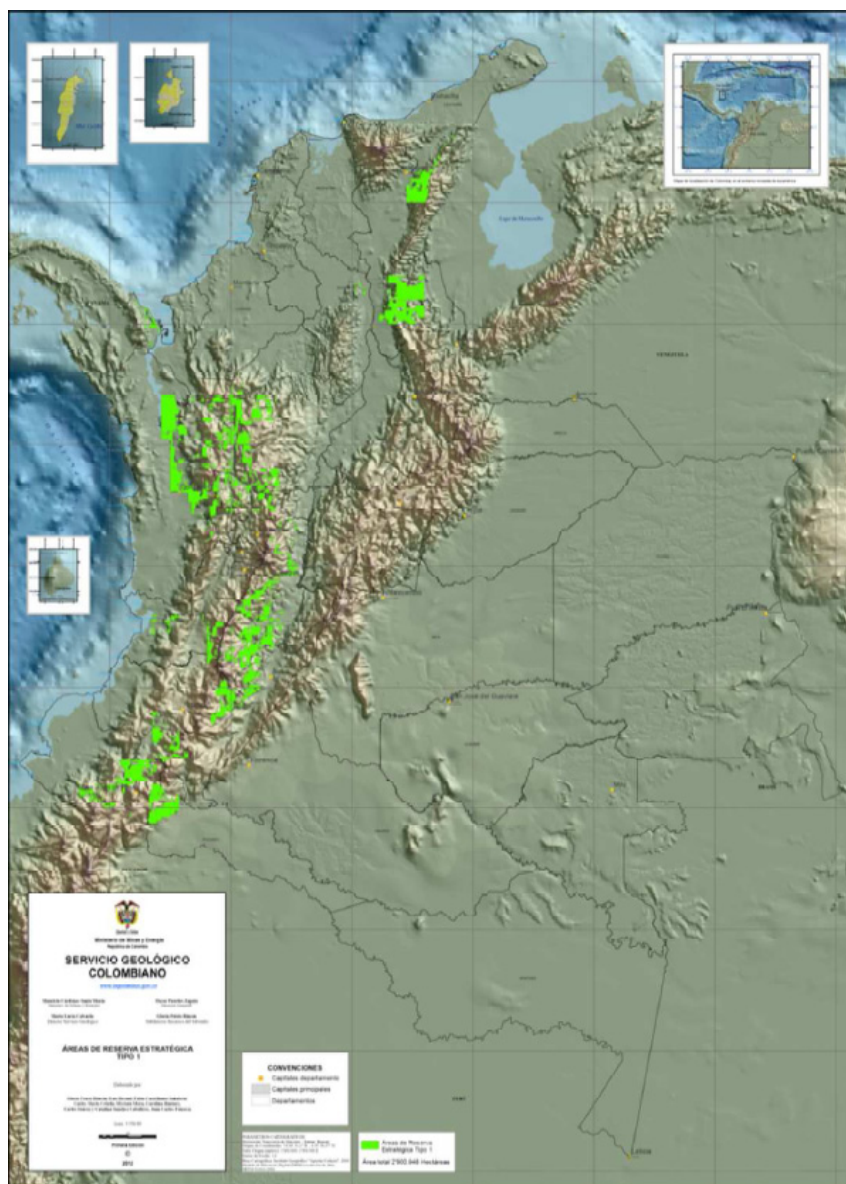
The Geological Survey of Brazil has also been conducting a seafloor sampling project, where geochemical mapping is playing an important role. Iron and manganese oxide samples were collected and are under analysis and study. Studies on geodiversity, soil management and geomedicine are also supported by geochemical data. The geochemical Atlas of Rio das Velhas Basin was published and other geochemical atlases are under preparation. To carry out these projects, CPRM/SGB uses a network of Regional Offices and other support centres located all over Brazil.

Current Geochemical Activities in Brazil Soil and Stream Sediments Sampling



Colombia (Gloria Prieto, INGEOMINAS, Bogotá)

Following methodologies of the International Geochemical Mapping Project (IGCP Projects 259 and 360), the Geological Survey of Colombia (INGEOMINAS) continues to develop systematic geochemical sampling throughout the country. During 2012, INGEOMINAS started a new geochemical sampling programme to cover 200,000 km² in areas with high mineral potential. These areas have been declared as strategic areas by the national government and comprise the Andean region and also the eastern part of Colombia. The sampling programme began in 2012 along the Antioquia Region located in the Western and Central Cordillera belonging to the Andean region. INGEOMINAS will continue to carry out its regional geochemical programme at different sampling densities during 2013 to cover new zones to provide geochemical information to the Colombian society.



Designated strategic areas in the Andean Region of Colombia

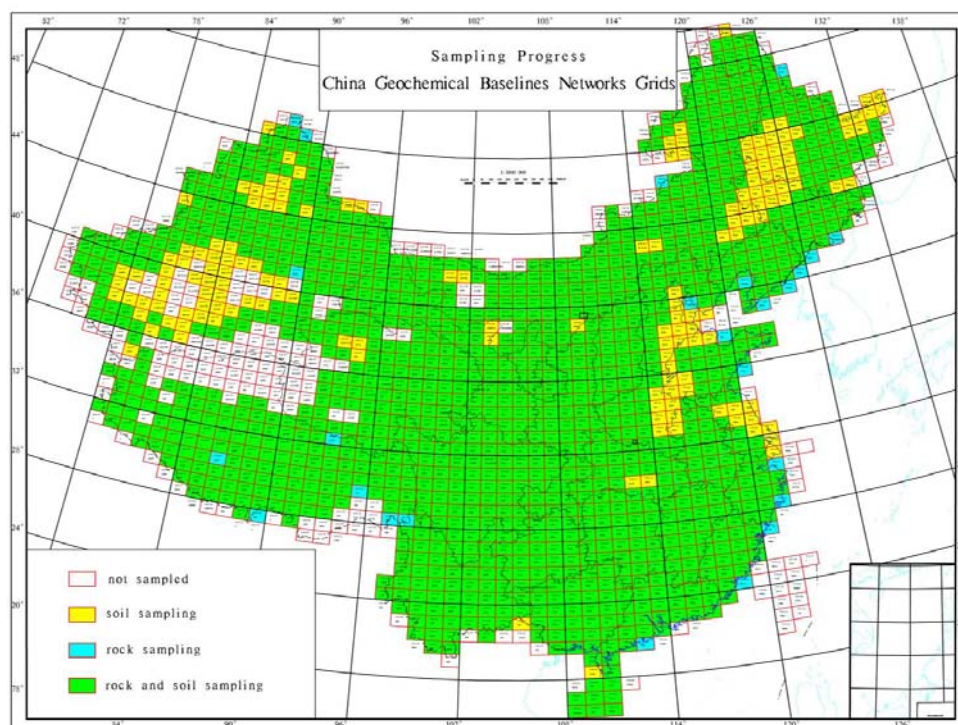
China and other Asian countries (Xueqiu Wang, IGGE, China)

China Geochemical Baselines: Preliminary Results

The China Geochemical Baselines Project (CGB) is a contribution to the IUGS/IAGC Task Group on Global Geochemical Baselines. Its purpose is to document China's nationwide geochemical baselines, spatial distribution and evolution of all elements. Each Global Reference Network (GRN) cell is divided into 4 CGB cells. Approximately 1,500 CGB cells cover the whole of China (9.6 million km²). Soil samples for pedosphere and rock samples for lithosphere geochemical baselines will be collected in each cell. At two sampling sites homogeneous samples of soils/overbank/floodplain sediments from each CGB cell will be collected. At each site, two samples are taken: 0-25 cm depth and >100 cm depth. Typical rock samples, representing different geological units, are concurrently collected in each CGB cell to interpret the geogenic sources of secondary geochemical patterns, and to explore the evolution of elements with geological time from Archeozoic to Quaternary. A 1000 g sample is ground to <200 mesh in an agate or pure-aluminium-porcelain mill. A 500 g sample is sent to the lab for analysis. The remaining sample is bottled and archived. Seventy-six elements are determined by ICP-MS/AES following 4-acid digestion and by XRF following fusion as the backbone methods combined with another 10 methods. Analytical quality is under strict control by using standard reference samples.

Internet-based software named Digital Chemical Earth, similar to Google Earth, is being developed, which can manage the geochemical database and allow people to access vast amounts of geochemical data and maps through the Internet.

A 5-year term, from 2008 to 2012, is planned for covering the whole of China's mainland. A one-year pilot study was conducted in 2008 to test and refine the recommended protocols and to optimise field logistics for the geochemical sampling. After completion of the pilot studies, approximately 3500 soil sites (7000 samples) and 10,000 rock samples have been collected in eastern China from 2009 to 2012. Sampling is expected to be completed in 2012 with the data and atlas published in 2013. Preliminary results show that (i) lithosphere geochemical baselines provide geochemical responses for geological boundary or geological events (e.g. Ir background values in Cretaceous and Tertiary rocks are 0.02 ppb, Ir anomalies in Cretaceous and Tertiary (K-T) boundary range from 0.2-0.8 ppb); (ii) many of the toxic elements such as Hg, As, Cd, Pb and halogen elements such as F, Cl, Br and I tend to concentrate in top soils and are influenced by human activities; (iii) major elements such as Ca and Al show the influence of climate and geography; (iv) metallic elements such as Au, Ag, W, Sn, Cu, and U are related

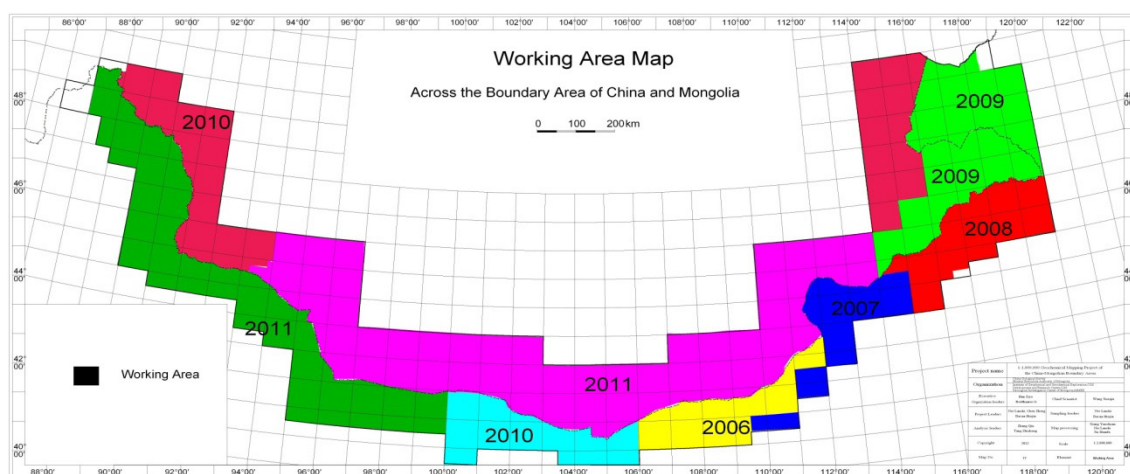


to metallogenic provinces and geology. These results were presented at the 34th IGC in Australia in August, 2012.

Sampling Coverage of China Geochemical Baselines (colour areas are finished)

Geochemical Mapping across the Boundary Regions of China and Mongolia

China is cooperating with Mongolia in geochemical mapping at a scale of 1:1,000,000 covering an area of approximately one million km² across the two countries. The project was launched in 2008 under an agreement issued by the China Geological Survey and the Mineral Resources and Petroleum Authority of Mongolia. The Institute of Geophysical and Geochemical Exploration is helping with training in sample-collection protocols and is providing free chemical analysis. The sampling methods were developed specifically for the project landscapes of desert, Gobi, grassland and mountains. A total of 10532 samples have been collected across the boundary area of approximately 1 050 000 km² at a sample density of 1 per 100 km². The analytical methods were principally ICP-MS, ICP-AES and XRF combined with a further 10 methods. High-quality data were reported under strict quality control using standard reference materials. Geochemical atlas of 69 elements and organic carbon were produced. The results showed that (i) regional geochemical patterns were identified for the first time across the world's largest REE ore deposit in Inner Mongolia; (ii) regional geochemical patterns of Ag-Pb-Zn have good correlation with the polymetallic province along the east part of the boundary region; (iii) regional geochemical patterns of Cu-Au-Mo have good correlation with the porphyry metallogenic province along the middle part of the boundary region. The final report, analytical data and atlas were presented to Mongolia in August 2012. Four scientists were awarded the Mongolian Medal of Honour, which is the highest-ranking honour for geologists who have made a great contribution for Mongolian Geology and Mineral Resources.



Coverage area of geochemical mapping across the boundary region of China and Mongolia



Presenting the final report and atlas to Mongolia



Mongolian Media interviewing Dr. Wang Xueqiu, Principal Scientist of the project and Co-leader of the Task Group.



The Mongolian Medal of Honour awarded to 4 Chinese scientists

CCOP Geochemical Baseline Programme

As detailed in the 2011 Annual Report, the China Geological Survey has approved a proposal to provide financial and technical support for a Geochemical Baseline Programme within the member countries (China, Japan, Vietnam, Indonesia, Singapore, Cambodia, Thailand, Malaysia, Papua New Guinea, Philippines and Korea) of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP). A training course on geochemical mapping was held in Nanjing, China, on 28-29 March, 2012. A total of 55 participants from 14 CCOP countries attended the seminar. Dr Wang Xueqiu and Dr David Smith, co-leaders for IUGS/IAGC Task Group on Global Geochemical Baselines, and Mr Alecos Demetriades, treasurer for the Task Group, gave presentations on the following topics: History and Accomplishments of the IUGS/IAGC Task Group on Global Geochemical Baselines, Global-scale Geochemical Baselines Mapping, Regional-/National-scale Geochemical Mapping in China, Geochemical Atlas of Europe: Techniques and Management, European Ground Water Geochemistry Atlas Using Bottled Water as a Sampling Medium, European Geochemical Atlas of Agricultural and Grazing Land Soil, Continental-scale Soil Geochemical Survey in North America.

Geochemical mapping training course

A training course on Geochemical Mapping for Asian Countries was conducted from 31 October to 4 November, 2012 in Beijing. Forty-six geoscientists from Asian countries participated.

Japan (Atsuyuki Ohta, Geological Survey of Japan, AIST, Tsukuba)

The Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology, has conducted research on the fundamental geochemical properties of earth surface materials [<http://riodb02.ibase.aist.go.jp/geochemmap/>]. For a geochemical mapping project, 3,024 stream sediments and 4,905 surface marine sediments (the uppermost area of 0–3 cm) around Japan were collected. The mean sampling density of the stream sediments and coastal sea sediments is one sample per 100–120 km² and per 60–80 km², respectively. The stream sediment samples were dried in air and sieved with a 83-mesh (180 µm) screen. Magnetic minerals were removed using a magnet to minimise the effect of their accumulation. In contrast, marine sediment samples were air dried and ground with an agate mortar and pestle. Rocky, cobble, pebble, and gravel sediments were not used for geochemical mapping wherever possible. The samples were digested using a HF-HNO₃-HClO₄ mixed acid solution and 53 elements including toxic elements (e.g., As, Cd, and Hg) were analysed using ICP-AES, ICP-MS, and AAS. Analytical quality was confirmed using geochemical reference materials. In addition, a simple speciation geochemical mapping using the 0.1 M hydrochloric acid (HCl) soluble fraction of stream sediments was also prepared. As a next phase, we have proceeded with preparation for higher density geochemical mapping (one sample per 9 km²) focused on an urban region using stream sediments and soil materials. The elemental concentrations are determined for the bulk, 1M and 0.1M HCl soluble fractions. The analytical elements are the same as the nationwide geochemical mapping project.

India (Pradip K Govil, National Geophysical Research Institute, Hyderabad)

Sampling and most analysis by the National Geophysical Research Institute, Hyderabad, was completed as part of the Global Geochemical Baselines project in India in 2011. During 2012, final maps for 22 elements for top soil have been prepared and interpreted with reference to the geology of the area. Maps for Andaman Islands have also been finalised. Geochemical maps for bottom soil have been prepared and interpreted for chromium, nickel, zinc, iron, aluminium, calcium, magnesium, strontium and rubidium. Work is in progress for the remaining elements.

Africa

Sierra Leone (Alhaji Lamin Turay, Geological Survey Department Ministry of Mineral Resources, Sierra Leone)

Sierra Leone has been making some efforts in conducting geochemical studies, but these have been confined to stream sediment sampling and analysis to serve in mineral exploration research programmes. In April, 2010, the Government of Sierra Leone invited consultants to undertake geochemical mapping of the country for mineral exploration purposes under the 'Mining Technical Assistance Project' (MTAP) funded by the World Bank. The main objective of the assignment is to provide ecoscientific/geochemical information (maps at a scale of 1:10,000) for 9 areas (sheets). To this end, the project is focused on sampling, analysing and mapping mineral occurrences in the selected areas to produce metallogenic maps and an assessment of the resource potential of the surveyed areas. The distribution of anomalies will be used to define metallogenic provinces and identify prospective areas with a view to generating private sector interest for further exploration and development. To date, a total of 1255 stream sediment and 32 panned concentrates samples have been collected within the first phase of the programme. The stream sediments samples were prepared by ALS in Ghana, with subsequent analysis carried out in the ALS laboratories in Vancouver, Canada using a combination of ICP-MS and ICP-AES techniques. The target minerals are gold, platinum group metals, base metals, iron and Coltan (niobium/tantalum). The second phase of the project involved soil sampling on all the 9 sheets with high stream sampling anomalies. A total of 4321 samples were collected, but only 3250 samples were sent for analysis because of financial constraints. Soil sampling results are expected in 2013.

South Africa (J.H Elsenbroek and M. Cloete, Council for Geoscience, Pretoria)

The Council for Geoscience routinely conducts baseline geochemical mapping of the land surface of South Africa and has opted to do so by means of an ongoing, high density regional geochemical survey using a sampling density of one sample per square kilometre. First order stream sediments and soil samples have been collected for two separate regions, each about 200,000 km² in extent. The national regional geochemical mapping programme has been ongoing for about 30 years and has seen major improvements over time, especially with regard to sample collection, sample preparation, range of elements analysed and data applications. The key aspects of sample density, total analysis and archiving of samples, however, have not changed.

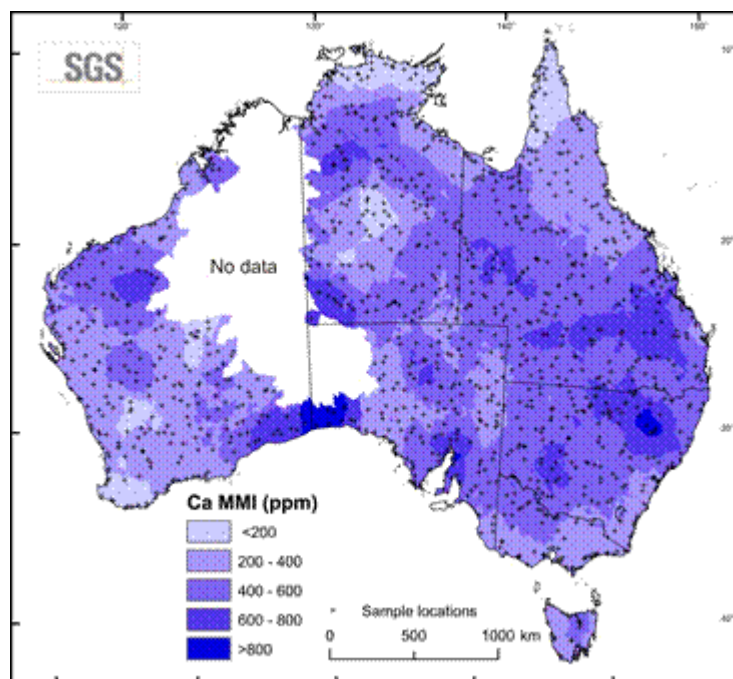
Routine geochemical mapping has and will continue to be undertaken during the 2012-13 financial year. Soil geochemical sampling is being undertaken in the Kwazulu-Natal Province in the Nkandla area on the Nsuze Group. An area of 3358 km² will be covered. Four soil samples will be taken on a square kilometre grid giving a total of approximately 13,432 samples.

International geochemical projects have been conducted in partnership with BEAK Consultants in Rwanda. In four target areas, stream sediment samples were taken and follow-up trenching was carried-out in mineral promising areas.

It is well recognised, however, that the sampling density of the South African National geochemical mapping programme is orders of magnitude higher than recommended for the global baseline mapping programme. The Council for Geoscience is nevertheless keen to get involved with global baseline mapping as envisaged by the Task Group, but will, for the short to medium term, need to adhere to the current high-density sampling of select areas. To sustain two baseline mapping programmes is not feasible at this stage, but should a research

Australia (Patrice de Caritat, Geoscience Australia, Canberra)

As report previously, the National Geochemical Survey of Australia (NGSA) was completed in 2011 with the delivery of a geochemical atlas, a data set and a series of reports (www.ga.gov.au/ngsa). The NGSA collected catchment outlet sediment samples (similar in most cases to floodplain sediments) near the lowest points of 1186 catchments distributed nationally (covering ~6.2 million km² or 81% of Australia; see map below). Within each catchment, at least one site was sampled near the surface (0-10 cm) as well as at depth (~60-80 cm on average).



Map of Ca concentration across Australia, as determined by Mobile Metal Ion® analysis of NGSA samples (Mann et al., 2012).

In 2012 a few additional datasets were released to complement those released last year. These include (1) the national catchment polygons coverage used to determine target sampling sites; (2) the particle size dataset; and (3) the Loss on Ignition (LOI) dataset and maps. All these, as well as the original 600+ maps, can be downloaded from www.ga.gov.au/ngsa. Several oral and poster presentations on the analysis of NGSA data were given at the 34th International Geological Congress in Brisbane in August 2012. In addition, a number of papers have been published, mainly focussing on high-level comparisons of the Australian data with other continents; more detailed analysis of the NGSA data is under way.

Europe (Clemens Reimann, NGU, Trondheim, Norway)

The two volumes of the FOREGS-EuroGeoSurveys Geochemical Atlas of Europe (Salminen *et al.*, 2005; De Vos *et al.* 2006) are still proving to be very popular. Both volumes are available for free download from <http://weppi.gtk.fi/publ/foregsatlas/>. The complete European database of all field and geochemical data collected as part of this project and the related digital photo archive are also freely available at this website. The data that are of widest interest are the stream water data, since this is the only harmonised data set in Europe and complies to the specifications of the Directive on Infrastructure for Spatial Information in the European Community (INSPIRE: <http://inspire.jrc.ec.europa.eu/>), and to the Water Framework Directive 2000/60/EC (http://ec.europa.eu/environment/water/water-framework/index_en.html).

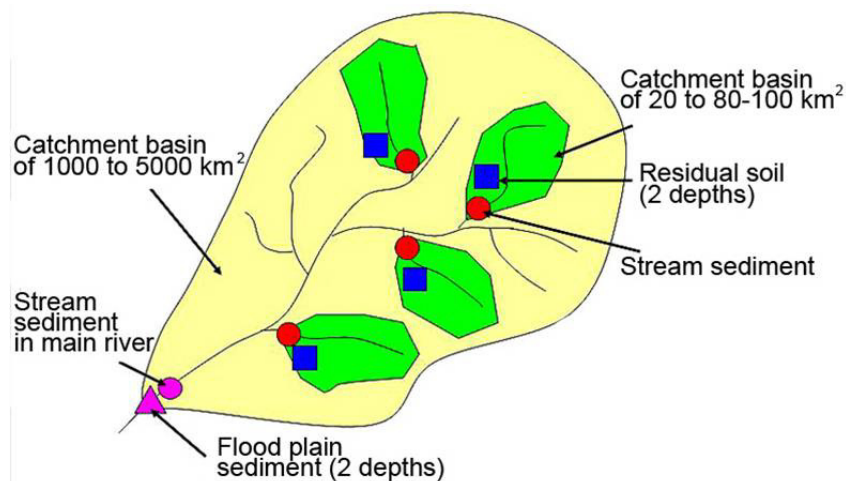
The EuroGeoSurveys Geochemistry Expert Group, under the chairmanship of Clemens Reimann of the Geological Survey of Norway, continues to be active in developing new initiatives throughout the European geochemical community. A three-day business meeting of the Group was held in Lisbon, Portugal, from the 22 to 24 October 2012. The focus of the meeting was on the GEMAS project (<http://gemas.geolba.ac.at/>), which is partly funded by the European Association of Metals (<http://www.eurometaux.org/>) for the provision of data for compliance with the European Commission's REACH Directive (Registration, Evaluation and Authorisation of Chemicals – http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm/). During the meeting the contents of the pending Geochemical Atlas was discussed. The texts are scheduled to be reviewed and submitted to the publisher by the end of January 2013. It is anticipated that the printed version of the atlas will be ready by the end of August 2013, and a formal presentation is planned in September or October 2013 in Brussels. A session was held on the status of the Urban Geochemistry project of major European cities using a common approach; all samples, following preparation, are being analysed at the same commercial laboratory that was used for the analysis of the GEMAS samples. The last participating city from Norway will be sending the collected samples to the agreed commercial laboratory for analysis by the end of 2012. Another book on urban geochemistry in Europe is planned to be published early in 2015.

At the meeting the newly published geochemical atlas of Spain was presented (<http://www.igme.es/INTERNET/actividadesIGME/lineas/CartoGeo/geoquimica/geoquimicaln.htm>). In a four years period, about 40,000 samples were collected from the whole Spanish territory. A total of 63 chemical elements were analysed, including those that are dangerous for ecosystems, pesticides in agricultural areas and dioxins and other organic pollutants in industrialized areas, as well as pH and TOC.

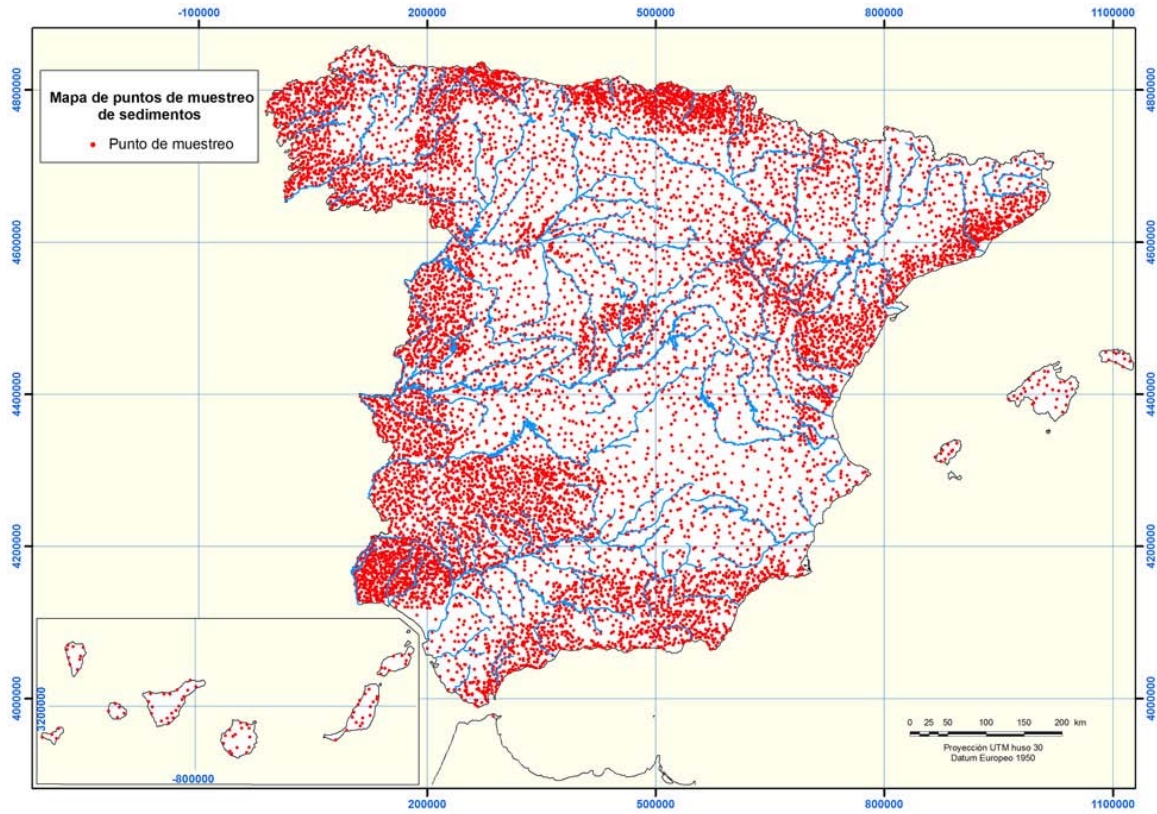
Different materials were sampled, according to the following methodology, which follows the IGCP 259 recommendations:

- Composite stream sediments and residual soil samples from two depths (0-25 cm and 25-50 cm) were collected. A total of 36,400 samples were collected from 14,000 sampling points (sediments + 2 soil samples)
- Floodplain sediments at two depths (top and bottom) in drainage basins of 3,000 to 6,000 km². A total of 664 floodplain sediment were collected from 332 sampling points.

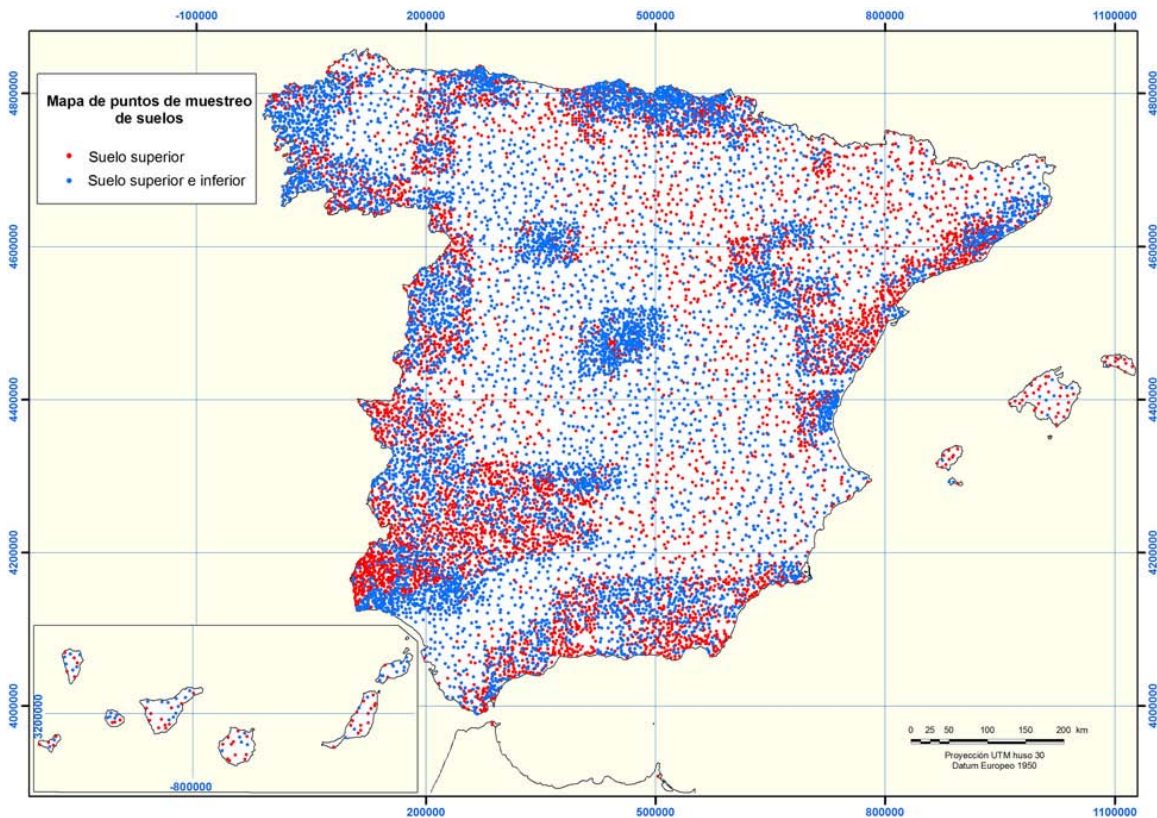
Three sampling densities were foreseen in the project, according to the geological complexity of the area, industrial and demographic pressure (1 sample point / 10 km², 1 sample point / 20 10 km² and 1 sample point / 100 km²).



Sampling scheme in Spain is similar to IGCP 259 specifications.



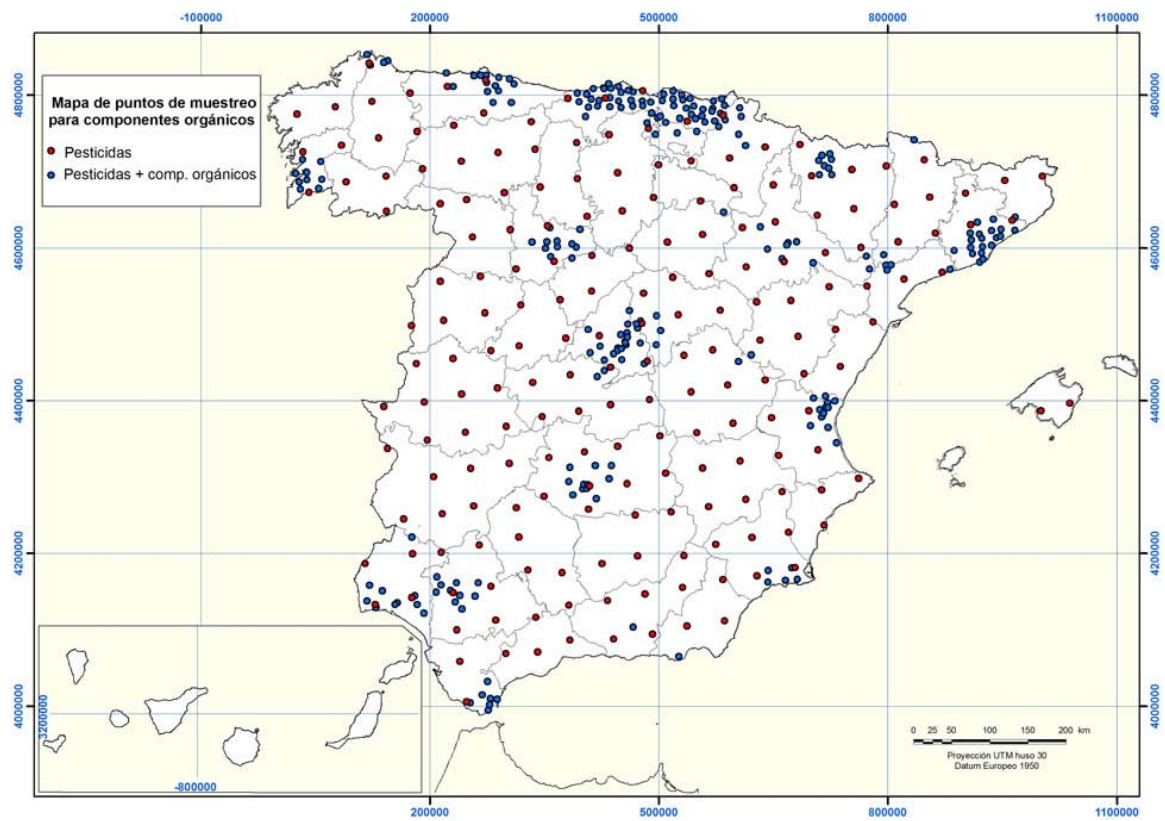
Stream sediment sample sites in Spain.



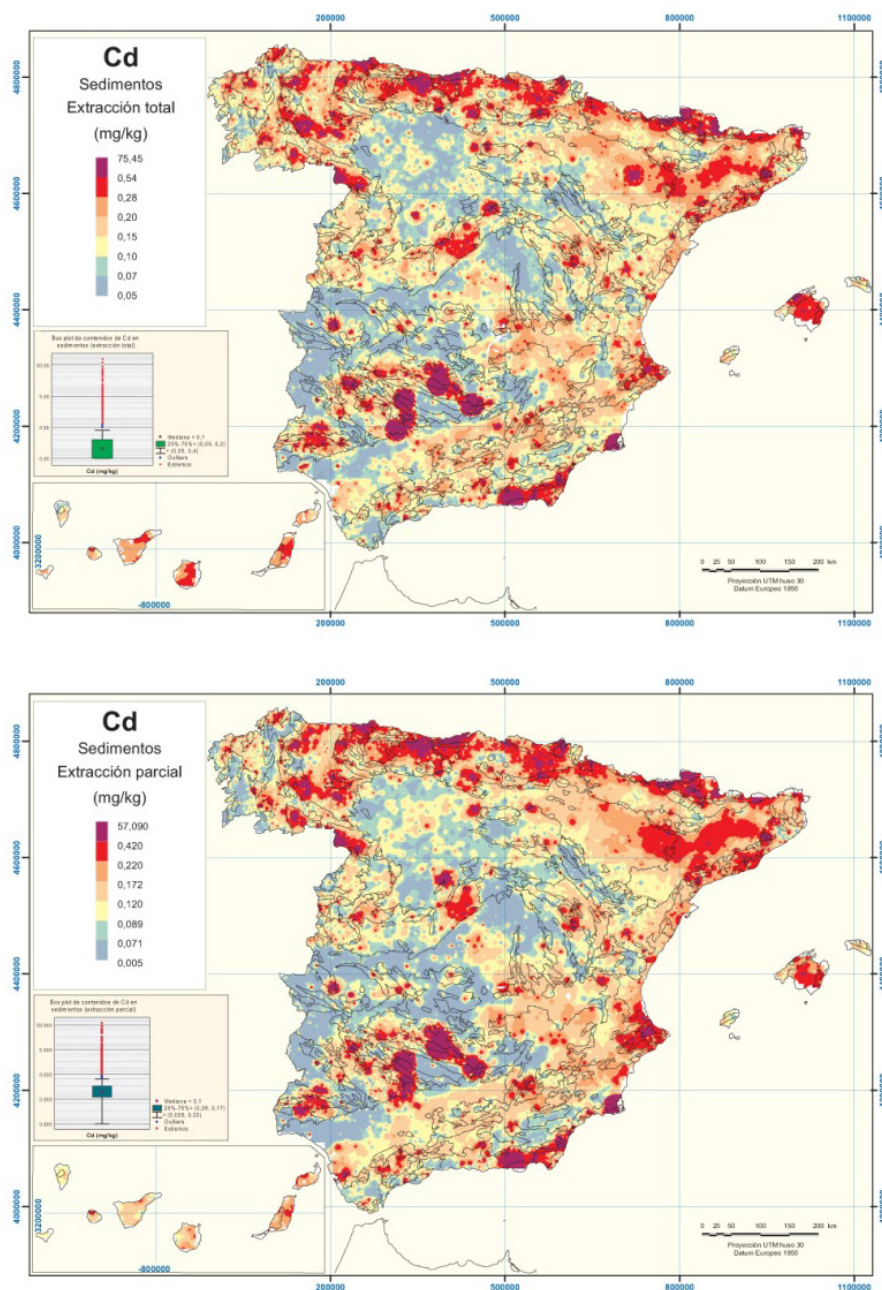
Residual soil sampling sites in Spain.



Floodplain sediment sites in Spain.



Sample sites for organic compounds.



Two distribution maps of Cd (total and partial extraction) from the geochemical atlas of Spain.

Regional geochemical mapping of Kyrgyzstan (Rolf Tore Ottesen and Jim Bogen, NGU, Norway)

The project is a part Norwegian CPEurasia programme for the period 2010-2014. The partners are: KG-Asanaliev's Kyrgyz Institute of Mining Technologies; Department of Geology, University of Tromsø; Norwegian University of Science and Technology; Geological Survey of Norway; Norwegian Water Resources and Energy Directorate. The estimated cost of four year programme is NOK 4 M (~USD 0.7 M).

The main focus of the project is to introduce a research based educational programme at the Kyrgyz Technical University, with focus on teaching and thesis work on geochemical mapping research. Our intention is to involve both Kyrgyz and Norwegian students in the project. The main scientific goal will be to prepare maps of Kyrgyzstan showing the distributions of more than 70 elements, based on low density sampling of floodplain/overbank sediments.

Geochemical maps are of great importance for both mineral prospecting and environmental studies, and the International Year of the Planet Earth, which ended in 2010, concluded that such maps might represent the most urgent and important task within geology for sustainable development of a country.

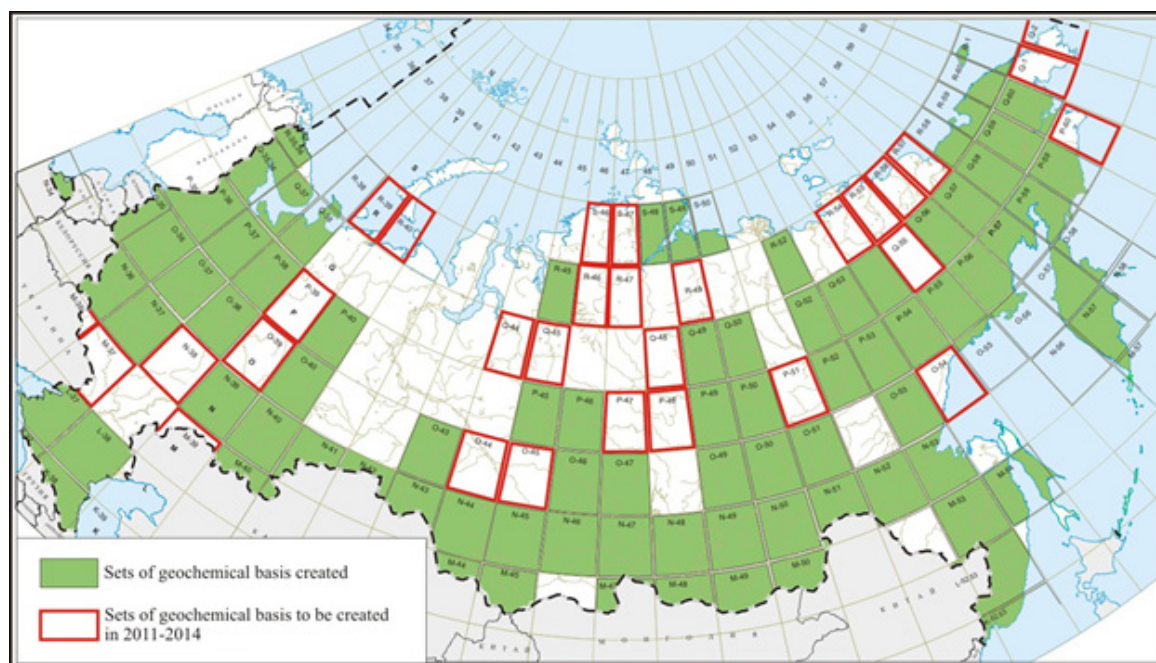
Environmental geology is an important part of the research in Kyrgyzstan. Developing resource geology and mining inevitably results in impact on geological environment and, therefore, requires specialists in environmental geology to be trained and/or provided with further professional development. This will make it possible to provide environmentally sound preventive and mitigative measures in geological investigations and mining development. After training courses in Kyrgyzstan and Norway, the students are now collecting overbank sediments (top and bottom) from 500 sites in the whole country. All the samples will be analysed for 40 elements in ALS-laboratory in Kyrgyzstan. The end product will be a geochemical atlas of Kyrgyzstan in 2014.



One of the sample localities near Bhiskek, Kyrgyzstan

Russia (Arkadiy Golovin, Institute of Mineralogy, Geochemistry, and Crystal Chemistry of Rare Elements, Moscow)

In the Russian Federation during 2012, the main type of geochemical work, as in the previous years beginning from 1995, was to create digital geochemical data and maps at a scale of 1:1000000. Geochemical products include a set of digital maps, charts, and accompanying inventories arranged in sheet-by-sheet data banks. These materials contain the optimal set of the original geochemical information that allows us to enhance the information-bearing and predictive capacities of the geological maps on a quantitative basis.



Current status of geochemical mapping of the territory of Russia at a scale of 1:1 000 000

Public Relations Accomplishments (Alecios Demetriades)

The main priority of the Public Relations and Finance committee is to promote the project for the purpose of attracting sponsors that may be interested to finance the Global Geochemical Baselines project in different parts of the World.

One of the main priorities is the reorganisation and update of the Task Group's website material, including preparation of templates and uploading material to the server of the new website provider (<http://www.globalgeochemicalbaselines.eu/>). Due to technical problems, it was not possible to update the website during 2011. Hence, it was decided to contract a commercial company to redesign the website, and to train the public relation officer in its update. At the time of writing, the new website is almost ready and, pending minor correction to the content, should be uploaded and running by the end of November or beginning of December 2012. The website hosting the Geochemical Atlas of Europe (<http://weppi.gtk.fi/publ/foregsatlas/>) is still very important for the promotion of the Global Geochemical Baselines project. Hotlinks have been established to the Atlas site from the sites of EuroGeoSurveys, many European Geological Surveys, and also professional organisations, e.g. the Association of Applied Geochemists, International Medical Geology Association, and the Society of Environmental Geochemistry and Health. Another important website, which is now in operation, concerns the GEMAS project of the EuroGeoSurveys Geochemistry Expert Group. The website is hosted by the Geological Survey of Austria (<http://gemas.geolba.ac.at/>) and the webmaster is Paolo Valera from Italy. A novel idea is the uploading of two photographs from each sampling site to Google Earth – work that is done by Edith Haslinger in her own time. Thus, interested people can fly directly to the sampling site and see a landscape and a soil profile photograph.

In 2010, the EuroGeoSurveys Geochemistry Expert Group decided to produce a GEMAS calendar for 2011, 2012 and 2013, for the promotion of the project. The calendar for 2012 has been produced in electronic and print versions (A4 size). The cost of the printed version was paid by the royalties received from the sales of the book '*Geochemistry of European Bottled Water*' (<http://www.schweizerbart.de/publications/detail/artno/001201002>). Each calendar has 12 photographs from different countries, which display European agricultural and grazing land landscapes. The third calendar for 2013 is being designed during this period, will be

printed in A3 size, and will have 12 of the best photographs of European agricultural and grazing land soil. The cost of the printed version will be paid by the royalties received from the sales of the above mentioned book, and those received from the sales of the book '*Mapping the Chemical Environment of Urban Areas*' (<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470747242.html>).

The CD of the FOREGS/EuroGeoSurveys Geochemical Atlas of Europe, which includes the two volumes of the Atlas, the analytical data, the field manual, the IGCP 259 Report "*A global geochemical database for environmental and resources management*" (Darnley *et al.*, 1995), and other useful information, is still being distributed at international conferences, congresses and meetings. More than 2400 copies have been distributed to date (1300 copies by EuroGeoSurveys office and over 1100 copies by the Public Relations and Finance Committee).

Another significant promotional activity has been the distribution of the memorial issue DVD to honour Arthur G. Darnley (1930-2006). The DVD includes all the material from the Geochemical Atlas of Europe CD, all publications from 1988 to 2008 of the two IGCP programmes 259 'International Geochemical Mapping' and 360 'Global Geochemical Baselines', and copies of all papers from the *Arthur Darnley Symposium - Geochemical Mapping from the Global to the Local Scale* - held at the 32nd IGC, Oslo, Norway. About 1500 copies of the DVD were made, and up to the end of October 2012, more than 1200 copies have been distributed at workshops, conferences, congresses and meetings, and also posted to interested university students and professionals.

The Task Group supported the registration fee for two graduate students to attend the 34th International Geological Congress in Brisbane, Australia, in 2012. The students, whose studies are focused on geochemical mapping, were Ms Liu Xuemin of China and Mr. Darshana Abeysinghe of Sri Lanka.

In 2012, the Task Group published a paper in *Earth Science Frontiers* titled "*The IUGS/IAGC Task Group on Global Geochemical Baselines.*" This paper provided a summary of the history and accomplishments of the Task Group. See Section 9 for the complete reference.

8. CHIEF PROBLEMS ENCOUNTERED IN 2012

The main problem still facing the project is the lack of funding that is required to achieve the aims and objectives of the project at the global scale. The geochemical baseline project in Europe was completed with funding by the participating European Geological Surveys. Ongoing work in North America, Australia, India, China, Cyprus, Nigeria and Kyrgyzstan, for example, are similarly funded by national geological surveys or other national scientific institutions. Some proposed activities, such as the international geochemical mapping project by the member countries of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP), have been delayed because of a lack of available funding by the individual countries. Funds are required for training, transportation, additional analytical services and quality control. In addition, the Task Group is almost entirely dependent on funds from participating agencies for marketing activities, such as website development and workshops.

9. CHIEF PRODUCTS IN 2012

ARTICLES, PAPERS, ATLASES AND BOOKS

Caritat P de, Reimann C, NGS Project Team and GEMAS Project Team. 2012. Comparing results from two continental geochemical surveys to world soil composition and deriving Predicted Empirical Global Soil (PEGS2) reference values. *Earth and Planetary Science Letters*, **319-320**, 269-276.

Demetriades A, Reimann C, Birke M and the Eurogeosurveys Geochemistry EGG Team. 2012. European Ground Water Geochemistry Using Bottled Water as a Sampling Medium. Chapter 10. In: FF Quercia and D Vidojevic (Eds), *Clean Soil and Safe Water*. NATO Science for Peace and Security Series C: Environmental Security. Springer, Dordrecht, 115-139.

Demetriades A, Reimann C, Birke M and the EGG Team. 2012. The geochemical atlas of European ground water with Emphasis on Hellas. *Bulletin of the Geological Society of Greece, in press*.

Disla JMS, Janik L, McLaughlin MJ, Forrester S, Kirby J, Reimann C and the EuroGeoSurveys GEMAS Project Team. 2012. The use of mid-infrared spectroscopy for the prediction of the concentration of chemical elements extracted by aqua regia. *Geoderma, in press*.

Key RM, Johnson CC, Horstwood MSA, Lapworth DJ, Knights KV, Kemp SJ, Watts MJ, Gillespie M, Adekanmi MA and Arisekola T.M. 2012. Investigating high zircon concentrations in the fine fraction of the stream sediments draining the Pan-African Dahomeyan Terrane in Nigeria. *Applied Geochemistry*, **27**(8), 1525-1539.

Lapworth DJ, Knights KV, Key RM, Johnson CC, Ayoade E, Adekanmi MA, Arisekola TM, Okunlola OA, Backman B, Eklund M, Everett PA, Lister TR, Ridgway J, Watts MJ, Kemp SJ and Pitfield PEJ. 2012. Geochemical mapping using stream sediments in west-central Nigeria: Implications for environmental studies and mineral exploration in West Africa. *Applied Geochemistry*, **27**(6), 1035–1052.

Locutura J, Bel-lan A, García CA, Martínez S. 2012. *Atlas Geoquímico de España*. Instituto Geológico y Minero de España, Madrid, 592 pp. (A3 size) <http://www.igme.es/INTERNET/actividadesIGME/lineas/CartoGeo/geoquimica/geoquimicaIng.htm#resu>

Mann A, Caritat P de and Prince P. 2012. Bioavailability of nutrients in Australia from Mobile Metal Ion® analysis of catchment outlet sediment samples: continental-scale patterns and processes. *Geochemistry: Exploration, Environment, Analysis, in press*.

Petrović T, Mandić MZ, Veljković N, Papić P and Stojković J. 2012. Geochemistry of Bottled Waters of Serbia. In: FF Quercia and D Vidojevic (Eds), *Clean Soil and Safe Water*. NATO Science for Peace and Security Series C: Environmental Security. Springer, Dordrecht, 247-266.

Reimann C, Caritat P de. GEMAS Project Team and NGS Project team. 2012. New soil compositional data for Europe and Australia: Demonstrating comparability, identifying continental-scale processes and learning lessons for global geochemical mapping. *Science of the Total Environment*, **416**, 239-252.

Reimann C, Flem B, Fabian K, Birke M, Ladenberger A, Negrel P, Demetriades A, Hoogewerff . and the GEMAS Project Team. 2012. Lead and lead isotopes in agricultural soils of Europe – The continental perspective. *Applied Geochemistry*, **27**(3), 532-542.

Reimann C, Filzmoser P, Fabian K, Hron K, Birke M, Demetriades A, Dinelli E, Ladenberger A and the GEMAS Project Team. 2012. The concept of compositional data analysis in practice — Total major element concentrations in agricultural and grazing land soils of Europe. *Science of the Total Environment*, **426**, 196-210.

Reimann C, Birke M and Filzmoser P. 2012. Temperature-dependent leaching of chemical elements from mineral water bottle materials. *Applied Geochemistry, in press*.

Schucknecht A, Matschullat J, Caritat P de, Silva da J, Melo G Jr, Plessow A and Mello JWB. 2012. Pedogeochemistry in NE-Brazil -- Compared to Australia and Europe. *The Science of the Total Environment*, **438**, 342-356.

Smith DB, Wang X, Reeder S and Demetriades A. 2012. The IUGS/IAGC Task Group on Global Geochemical Baselines. *Earth Science Frontiers*, **19**(3), 1–6.

Smith DB, Cannon WF, Woodruff LG, Rivera FM, Rencz AN, and Garrett RG. 2012. History and progress of the North American Soil Geochemical Landscapes Project, 2001–2010. *Earth Science Frontiers*, **19**(3), 19–32.

Smith DB, Smith SM and Horton JD. 2012. History and evaluation of national-scale geochemical data sets for the United States. *Geoscience Frontiers*, in press. Available on-line at <http://dx.doi.org/10.1016/j.gsf.2012.07.002>

Wcislo E, Korcz M, Dlugosz J and Demetriades, A. 2012. Risk-based approach to contaminated land and groundwater assessment: Two case studies. Chapter 5. In: FF Quercia and D Vidojevic (Eds), *Clean Soil and Safe Water*. NATO Science for Peace and Security Series C: Environmental Security. Springer, Dordrecht, 51-64.

ORAL AND POSTER PRESENTATIONS

IGC 2nd Arthur Darnley Symposium

The Task Group organised the 2nd Arthur Darnley Symposium at the 34th International Geological Congress, Brisbane Australia, August 2012, Session 4.2.2 - Global geochemical mapping: understanding chemical Earth, at which a number of oral and poster presentations were given:

IGC 2nd Arthur Darnley Symposium Oral Presentations

Xueqiu Wang, Lanshi Nie, Shanfa Xu. *A world geochemical map: Understanding chemical Earth 2*.

Patrice de Caritat, Michelle Cooper, Evgeniy Bastrakov, Subhash Jaireth, John Wilford. *The National Geochemical Survey of Australia: overview and results to date*.

Pradip K Govil. *Global geochemical baseline mapping for environmental management using top soil in India: An overview*.

David Cohen, Neil Rutherford, Shawn Laffan, Andreas Zissimos, Eleni Morisseau. *The soil geochemical atlas of Cyprus—Advantages of a high density regional survey*.

Atsuyuki Ohta, Noboru Imai. *A nationwide marine geochemical mapping project in Japan*.

Arkadiy Golovin, Natalya Gulyaeva, Olgo Kal'eva, Boris Kolotov. *Assessment of environment pollution with toxic chemical elements, using multipurpose geochemical mapping (MPGM)*.

Clemens Reimann, Manfred Birke, Alecos Demetriades, Christopher C. Johnson, GEMAS Project Team. *Geochemical atlas of European agricultural and grazing land soil*.

David B Smith, William F Cannon, Laurel G Woodruff. *Mapping the geochemistry and mineralogy of soils of the conterminous United States*.

PK Mukherjee, KK Purohit, PP Khanna, NK Saini. *Arc magmatic provenance for Lesser Himalayan sedimentary sequence (LHSS): trace elemental evidence from low-order stream sediment geochemistry and regional geochemical mapping*.

Guo-Li Yuan, Xiao-Chao Che, Gen-Hou Wang. *Cold-trapping of POPs in central Tibetan Plateau, China: influences of soil components*.

IGC 2nd Arthur Darnley Symposium Poster Presentations

Limin Ren, David Cohen, John Triantafylis, Neil Rutherford, Andreas Zissimos, Eleni Morisseau. *The soil geochemical atlas of Cyprus—controls on rare earth element patterns.*

Andreas Zissimos, Eleni Morisseau, Eleni Stavrou, David Cohen, Neil Rutherford. *The soil geochemical atlas of Cyprus—distribution of total and organic carbon.*

Clemens Reimann, Patrice de Caritat, GEMAS Project Team, NGS Project Team. *Comparison of two continental-scale geochemical surveys: what lessons for global geochemical mapping can we learn?*

Alethea EM Sallun, David B Smith, Bruna C Xavier, Cristiane LFA Roberto, Alessandro Cesarino. *Establishment of natural geochemical background values in the State of São Paulo, Brazil.*

Mauro Cesar Geraldos. *Using plasma spectrochemistry for the analysis of hazardous substances in the marine environment: the Sepetiba Bay, Rio de Janeiro (Brazil).*

Qingye Hou, Zhongfang Yang, Tao Yu. *Quantifying heavy metal inputs to agricultural soil in Peking, China.*

Jaana Jarva, Timo Tarvainen. *The use of soil geochemical baselines in land use planning in Finland.*

Christopher C Johnson, G-BASE Project Team. *Mapping the chemical environment of London, UK—an important contribution to understanding national levels of normal background contaminant concentrations.*

Clemens Reimann, Manfred Birke, Alecos Demetriades, Christopher C Johnson, EGG Project Team. *Geochemical atlas of European ground water: bottled water.*

Christopher C Johnson, Nigeria Geochemical Mapping Project Team. *Regional geochemical mapping in Nigeria: results from the collaborative project between the Nigerian Geological Survey Agency and the British Geological Survey.*

Lev Krinochkin, Arkadiy Golovin, Grigoriy Gusev, Viktor Kilipko. *Geochemical map of Russia scale 1:2500000.*

WF Cannon, David B Smith, Federico Solano, Tiffani Westphal, John Jackson. *Maps of the mineral content of soils of the conterminous United States.*

Laurel G Woodruff, David B Smith, William F Cannon. *Continental-scale soil geochemistry from the North American Soil Geochemical Landscapes Project.*

Katherine Stoate, Steve Hill, Karin Barovich. *In between fresh rock and fresh air: landscape geochemistry of Kangaroo Island.*

Mariangela Garcia Praca Leite, Raphael Vicq, Fellipe Pinheiro Chagas. *Geochemistry mapping: purpose of stream sediments sampling in two tropical basins, Brazil.*

Malte Willmes, Ceridwen Boel, Rainer Grün, Richard Armstrong, Antoine Chancerel, Bruno Maureille, Patrice Courtaud. *The bioavailable Sr isotope reference database of France—a tool for archaeology and forensic sciences.*

Weihai Xu, Xiangdong Li, Wen Yan, Li Miao. *Trace metals in atmospheric particular matters over the northern South China Sea (SCS): regional sources and long-range atmospheric transport.*

Xiaohuan Xi, Min Li, Zhongfang Yang. *An introduction: the multi-purpose regional geochemical survey and evaluation in China.*

Shuang Zhang, Dong Yang, Fanglin Li, Bin Huang, Zhengyu Bao, Dongfeng Zou, Decun Zhang. *The prediction of soil geochemical baseline with partition and multiple regression analysis: a case study in Jiangnan Plain, China.*

General Presentations and Abstracts

Albanese S, Lima A, Cicchella D, Civitillo D, Cosenza A and De Vivo B. 2012. *The GIS-aided colour composite maps of the Naples metropolitan area (Italy).* In: S Scappini and S Zapparoli (Eds), 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 682-683. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf

Albanese S, Lima A, Rezza C, Ferullo G and De Vivo B. 2012. *The Acerra-Marigliano conurbation: the geochemical baseline mapping of the north-eastern sector of the Naples metropolitan area.* In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 673-674. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf

Batista MJ, Locutura J, Cichella D, De Vivo B, Lima A, Demetriades A, Reimann C and FOREGS group members. 2012. *Tin concentrations in European soils.* 9th ISEG (International Symposium on Environmental Geochemistry), Aveiro (Porto), Portugal, 15-22 July 2012. <http://9iseg.web.ua.pt/web/index.php>

Birke M, Rauch U, Stummeyer J, Korte F and Keilert B. 2012. *Urban Geochemistry of the Berlin Metropolitan Area, Germany.* Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 462-463. <http://berlin.setac.eu/>

Birke M, Reimann C, Rauch E, Dinelli E, Demetriades A, Klos V and GEMAS Project Team. 2012. *GEMAS: Geochemical mapping of agricultural and grazing land soils at the European and national scales.* Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 34. <http://berlin.setac.eu/>

Cannon WF, Smith DB, Woodruff LG, Solano F, Westphal T and Jackson J. 2012. *Some maps of chemical and mineralogical composition of the conterminous U.S.* Sixth Workshop of the Northeast Soil Monitoring Cooperative, Troy, NY, March 13, 2012.

Cannon WF, Smith DB, Solano F and Woodruff LG. 2012. *Using quantitative mineralogy to enhance interpretations of national-scale patterns of trace element distributions in soil: Results from the USGS soil geochemical and mineralogical survey of the conterminous United States.* Geological Society of America Annual Meetings, Charlotte, NC, November 4-7, 2012.

Caritat P de and Reimann C, NGS Project Team and GEMAS Project Team. 2012. *Deriving preliminary empirical global soil reference values from two continental-scale geochemical surveys: PEGS2.* 34th International Geological Congress (Brisbane, Queensland, 5-10 August 2012), Proceedings, 1443.

Caritat P de and Grunsky E. 2012. *Robust principal components analysis of National Geochemical Survey of Australia data.* 34th International Geological Congress (Brisbane, Queensland, 5-10 August 2012), Proceedings, 1999.

Caritat P de, Mann A and Prince P. 2012. *The world's first continental-scale, partial digestion geochemical dataset: Mobile Metal Ion® analysis of Australian soils.* 34th International Geological Congress (Brisbane, Queensland, 5-10 August 2012), Proceedings, 2510.

- Cosenza A, Albanese S, Ayuso RA, De Vivo B, Lima A, Macaione E and Messina A. 2012. *The geogenic nature of some harmful element anomalies in the central sector of Peloritani Mountains (Sicily, Italy)*. In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 684-685. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf
- De Vivo B, Cicchella D, Lucia G, Lima A, Albanese S, Dinelli E and Valera P. 2012. *The geochemical atlas of agricultural and grazing land soils of Italy*. In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 667-668. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf
- De Vivo B, Albanese S, Lima A, Reimann C, Birke M, Schoeters I, Demetriades A and the GEMAS Project Team. 2012. *The GEMAS project: Geochemistry of European agricultural and grazing land soils*. In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 654. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf
- Demetriades A, Reimann C, Birke M and EGG Team. 2012. *The geochemical atlas of European ground water with Emphasis on Hellas*. Geological Society of Greece, Programme and Summaries, 12-13. Scientific Meeting of the Geological Society of Greece, 6 February 2012, New Amphitheatre, Central Building of Athens University (<http://www.geosociety.gr>)
- Dinelli E, Birke M, Reimann C, Demetriades A, De Vivo B and GEMAS Project Team. 2012. *Comparison of XRF and aqua regia data from agricultural soil in Europe: results from the GEMAS project*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 35. <http://berlin.setac.eu/>
- Dinelli E, Birke M, Reimann C, Demetriades A, De Vivo B and GEMAS Project Team. 2012. *GEMAS project – interesting results from the comparison of aqua regia and total element concentrations in European agricultural soil*. In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 669-670. http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th_EUREGEO_Volume_2.pdf
- Dodd M, Richardson M and Rencz A. 2012. *Metal bioaccessibility in Canadian soils: using the North American soil geochemical landscapes project*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 34.
- Eggen OA, Ottesen R-T and Jartun M. 2012. *Active local sources of PCBs in the Arctic*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 34. <http://berlin.setac.eu/>
- Fidler R and Reid A. 2012. *High Ti/Zr stream sediments in a sand dune-dominated environment*. 34th International Geological Congress (Brisbane, Queensland, 5-10 August 2012), Proceedings, 615.
- Govil PK. 2012. *Global Geochemical Baseline Mapping in India: An Overview*. Talk delivered during Training Course at Geological Survey of India, Hyderabad
- Govil PK. 2012. *Global Geochemical Baselines in India for Environmental Management*. Talk at JN Technical University, Hyderabad
- Govil PK. 2012. *Geochemical baseline mapping and strategies for remediation of contaminated sites: An overview*. Talk at Osmania University, Hyderabad

- Johnson CC, Scheib C, Scheib A, Flight DMA, Cave MR, Ander EL, Lister TR, Breward N and Appleton JD. 2012. *Mapping the chemical environment of London: the London earth project*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 34. <http://berlin.setac.eu/>
- Kirby J, Janik L, Forrester S, Mclaughlin MJ and Reimann C. 2012. *Predicting metal and metalloid partitioning in soils using infrared spectroscopic analysis*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 281. 6th SETAC World Congress 2012 and SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. <http://berlin.setac.eu/>
- Kriete C, Reimann C, Birke M and Demetriades A. 2012. *Quality assurance in the GEMAS project and results of the connected proficiency test*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 35. <http://berlin.setac.eu/>
- Lima A, Acerbo GG, Albanese S and De Vivo B. 2012. *Radiometric risk mapping and assessment of a urban environment: the Portici case study (Napoli, Italy)*. In: S Scappini and S Zapparoli (Eds), 2012. 7th EUREGEO: European congress on Regional Geoscientific cartography and Information systems. Proceedings, Volume II, 695-696. <http://geo.regione.emilia-romagna.it/gstatico/documenti/euregeo/7th EUREGEO Volume 2.pdf>
- Oorts K, Reimann C, Schoeters I and GEMAS Project Team. 2012. *Use of monitoring data for environmental risk assessment of metals in soil*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 35. <http://berlin.setac.eu/>
- Ottesen R-T and Eggen OA. 2012. *Urban geochemistry in Norway – monitoring and development from 1994-2011*. Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 463. <http://berlin.setac.eu/>
- Reimann C. 2012. *Geochemical Exploration: Past, Present and Future*. EUMICON conference, Leoben, 20 September 2012, Invited talk
- Reimann C, Birke M, Demetriades A and the GEMAS Project Team. 2012. *GEMAS: mapping soil properties and metal concentrations in agricultural and grazing land soil at the European scale*. 9th ISEG (International Symposium on Environmental Geochemistry), Aveiro (Porto), Portugal, 15-22 July 2012. <http://9iseg.web.ua.pt/web/index.php>
- Reimann C, Flem B, Fabian K, Birke M, Ladenberger A, Negrel P, Demetriades A, Hoogewerff J and the GEMAS Project Team. 2012. *Lead and lead isotopes in agricultural soils of Europe: natural distribution or contamination?* Abstracts, 6th SETAC World Congress/SETAC Europe 22nd Annual Meeting, 20-24 May, Berlin. SETAC Europe Office, Brussels, Belgium, 42. <http://berlin.setac.eu/>
- Reimann C and the GEMAS Project Team. 2012. *GEMAS: mapping soil properties and metal concentrations in agricultural and grazing land soil at the European scale*. Austrian Institute of Technology, Tulln, Austria, 5 October 2012, Invited talk.
- Smith DB. 2012. *IUGS/IAGC Task Group on Global Geochemical Baselines – History and accomplishments*. Geochemical Mapping Seminar for the CCOP Countries, March 29, 2012, Nanjing, China.
- Smith DB. 2012. *The North American Soil Geochemical Landscapes Project*. Geochemical Mapping Seminar for the CCOP Countries, March 29, 2012, Nanjing, China.
- Smith DB. 2012. *A national-scale soil geochemical database: A tool for assisting with exposure estimates, risk assessments, and environmental regulation*. Colorado School of Public Health, September 13, 2012.

Smith DB. 2012. *A new national-scale soil geochemical database for the conterminous United States*. State Risk Assessors' Teleconference, October 16, 2012.

Smith DB. 2012. *A new national-scale soil geochemical database for the conterminous United States: A tool for exploring human exposures through the soil pathway*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Human Health Regional Risk Assessors' Forum. November 15, 2012.

Smith DB, Goldhaber, MB and Morrison JM. 2012. *Arsenic in soils of the conterminous United States: Putting the rice-growing regions into a national-scale perspective*. Arsenic in Rice Workshop, U.S. Department of Agriculture and USA Rice Federation, Stuttgart, AR, July 26-27, 2012.

Tang J and Brown D. 2012. *Queensland geochemical inventory to support geoscientific research and mineral exploration*. 34th International Geological Congress (Brisbane, Queensland, 5-10 August 2012), Proceedings, 2003.

Tarvainen T. 2012. *GEMAS project: An overview*. HASE Group Meeting, (Finnish coordination group for monitoring of harmful substances), Finnish Food Safety Authority EVIRA, Helsinki, 29 May 2012.

Woodruff LG, Cannon WF, Smith DB, Solano F and Westphal T. 2012. *Geochemistry and mineralogy of soils in the Great Lakes region in a national perspective: The U.S. Geological Survey Landscape Geochemistry Project*. Western Great Lakes Resource Management Conference, Ashland, WI, April 17-18, 2012.

Woodruff LG, Cannon WF, Smith DB, Solano F and Westphal T. 2012. *Soil geochemistry and mineralogy for the conterminous United States - The USGS Geochemical Landscapes Soil Survey*. Geological Society of America Annual Meetings, Charlotte, NC, November 4-7, 2012.

Other Presentations, Posters, Abstracts and Dissemination of Promotional Material

CGS-CCOP-IUGS/IAGC Seminar on CCOP Geochemical Mapping, International Conference Hotel of Nanjing, city of Nanjing, China, 28 March 2012

Demetriades A and FOREGS Atlas Team. 2012. *Geochemical Atlas of Europe: Techniques and Management*.

Demetriades A, Reimann C, Birke M and the EuroGeoSurveys EGG Team. 2012. *European Ground Water Geochemistry Atlas: Using Bottled Water as a Sampling Medium*.

Demetriades A, Reimann C, Birke M and the EuroGeoSurveys GEMAS Team. 2012. *European Geochemical Atlas of Agricultural and Grazing Land Soil*.

Smith DB. 2012. *IUGS/IAGC Task Group on Global Geochemical Baselines: History and accomplishments*.

Smith DB. 2012. *The North American Soil Geochemical Landscapes Project*.

Wang X. 2012. *Global Geochemical Baselines – China Geochemical Baselines*.

Wang X. 2012. *Regional/National Geochemical mapping in China*.

Wang X. 2012. *A proposal for CCOP Geochemical Mapping*.

EuroGeoSurveys Geochemistry Expert Group Meeting – Geological Survey of Portugal, Lisbon, Portugal, 22 October, 2012. Oral presentations:

Urban Geochemistry project presentations

Rolf Tore Ottesen - Urban geochemistry in Norway

Timo Tarvainen - URGE project in Hameenlinna, Finland

Manfred Birke - URGE project in Achersleben, Germany

Ajka Sorsa - URGE project in Sisak, Croatia

Ray Scanlon - URGE project in Dublin, Ireland

Stefano Albanese - URGE project in Acerra-Marigliano-Pomigliano region, Napoli, Italy

Mateja Gosar - URGE project in Idrija, Slovenia

GEMAS project presentations

Edith Haslinger - GEMAS – Soil formation & soils of Europe

Alecos Demetriades - GEMAS precious metal results

Anna Ladenberger - Regional GEMAS project results from Norway/Sweden/Finland

Timo Tarvainen - GEMAS arsenic results

Manfred Birke - GEMAS cadmium results

Maria Joao Batista - GEMAS tin & tungsten results

Martiya Sadeghi - GEMAS cerium, lanthanum & yttrium results

Peter Hayoz - GEMAS results from Switzerland

New geochemical atlas presentation

Alejandro Bel-lan Geochemical Atlas of Spain

10. SUMMARY OF EXPENDITURES IN 2012

The Task Group received 5000 USD from IUGS in 2012. In 2012, the Task Group had the following expenditures totalling 4,609.61 USD: (1) support for two students to attend the 34th IGC (USD 1,205.68); (2) travel for Alecos Demetriades to attend the EuroGeoSurveys Geochemistry Expert Group Business Meeting (USD 778.93); and (3) development of the Task Group's new web site (USD 2,625; payment to be made upon completion of the web site development).

In addition to the expenditure of funds provided to the Task Group by IUGS, many Task Group goals are supported by various national geological survey organizations. The cost of the EuroGeoSurveys programme over the past year is estimated to be in excess of US \$50,000. The overall cost of the FOREGS/EuroGeoSurveys activities over the past decade or so is difficult to estimate as the work has been funded independently from each of the participating countries, but is thought to be in excess of US \$11M. These funds were provided from the Geological Surveys of the participating countries within Europe. The cost of the soil geochemical mapping project in the conterminous United States during 2012 was approximately US \$1M, and the Cyprus Soil Geochemical Atlas about US \$1M. There has also been considerable expenditure within a range of countries worldwide, as indicated in Section 7.

11. WORK PLAN FOR NEXT YEAR

The next business meeting of the Task Group will tentatively take place in 2013. It will likely be timed to coincide with the annual business meeting of the EuroGeoSurveys Geochemistry Expert Group, scheduled for autumn of 2013 in Brussels, Belgium.

The revision of the FOREGS Geochemical Mapping Field Manual (Salminen *et al.*, 1998) is progressing, and will be completed in 2013, and will most likely be published by the

Geological Survey of Finland in 2013. It will include new details on sampling in (a) Karstic terrains, prepared by A Demetriades, S Pirc, M Bidovec and F Sustersic, (b) Desert terrains by Xueqiu Wang (first draft completed in 2010), (c) Tundra terrains by Xueqiu Wang, (d) Arctic terrains by Rolf Tore Ottesen, and (e) Tropical terrains by Chris Johnson, Reijo Salminen, Xueqiu Wang and others.

Geochemical mapping projects will continue in many countries throughout the world as detailed in section 7.

In 2012, the Task Group received inquiries from Iran and Brazil about conducting training in geochemical mapping in those countries. It is possible that such training could occur in 2013, but nothing has been finalised.

12. COMMUNICATION AND DISSEMINATION PLANS

The IUGS/IAGC Task Group and all the national- and international-scale geochemical mapping projects being carried out in many countries plan to continue active participation in national and international symposia, conferences and workshops for the promotion of the global-scale project. A technical session on international-scale geochemical mapping is being planned for the Goldschmidt Conference, August 25–30, 2013 in Florence, Italy. Communication will also be achieved through continued output of peer-reviewed scientific papers, oral presentations, posters and promotional materials.

In addition, the Task Group's new website will be a key forum for communication and dissemination of information. This site should be functional by January 1, 2013.

13. SUMMARY BUDGET FOR NEXT YEAR AND POTENTIAL FUNDING SOURCES OUTSIDE IUGS

The success of the IUGS/IAGC Task Group on Global Geochemical Baselines has been, to date, almost entirely dependent on funding from sources outside IUGS and IAGC. This funding has come primarily from national geological surveys and other scientific institutions in participating countries. We conservatively estimate that over the past ten years, US \$32 M has been spent on broad-scale geochemical surveys conducted according to recommendations from the IUGS/IAGC Task Group and its predecessors.

Funding from IUGS has consisted of US\$ 1500 per year for 2003-2008, US\$ 4000 for 2009 and 2010, and US\$ 5000 for 2011 and 2012. IAGC has provided sporadic funding of US\$2000 on three occasions (2000, 2003, and 2004) over the past ten years to assist with travel expenses of Task Group members from developing countries to attend our business meetings. The Task Group currently has reserves of approximately USD 15,800. Given the current surplus of funds, we are not requesting any financial support from IUGS for 2013. However, should IUGS Council wish to provide continued funding, the Task Group will gladly accept and put the amount in the bank in anticipation of future requests for training courses or workshops.

14. CHIEF ACCOMPLISHMENTS 1998-2012

- 1998 Publication of Salminen R, *et al.* (1998) *FOREGS Geochemical Mapping Field Manual*. Geological Survey of Finland Guide Number 47.
- 1998 Release of the IUGS/IAGC Global Geochemical Baselines website, hosted by the British Geological Survey at www.bgs.ac.uk/IUGS.
- 1998 European GRN sampling programme commenced.
- 1999 Completion of pilot study for geochemical mapping carried out in Colombia.
- 2000 The Committee for Coastal and Offshore Geoscience Programmes (CCOP) agreed to act as a Regional Co-ordinator for their member countries (China, Japan, Vietnam,

- Indonesia, Cambodia, Thailand, Malasia, Papua New Guinea, Philippines, and Korea) in SE Asia.
- 2000 Symposium on geochemical baseline activities organised as part of the 31st International Geological Congress in Rio de Janeiro.
- 2001 Sampling and the majority of analysis completed in FOREGS countries. Preliminary maps of geochemical data for Europe prepared and preliminary interpretation begun.
- 2001 Meeting held with CCOP member countries during the Seminar on Regional Geochemical Exploration, Beijing, China to discuss their participation in the global project.
- 2002 Sampling and analysis completed in Southern India. Pilot studies partially completed within Colombia and Brazil.
- 2003 FOREGS poster, as the European contribution to IUGS/IAGC Working Group on Global Geochemical Baselines, and a two-page flyer prepared for promotional purposes.
- 2003 Launch of North American Soil Geochemical Landscapes Project.
- 2003 Launch of geochemical baseline mapping programme in India.
- 2004 Production of Part 1 of the FOREGS Geochemical Atlas of Europe, including background and introductory texts and geochemical maps for a wide range of sample media and chemical elements.
- 2005 Production of Part 2 of the EuroGeoSurveys/FOREGS Geochemical Atlas of Europe, including interpretation, papers on specialised data treatment, and supplementary tables, and figures and maps.
- 2006 Launch presentation of the Geochemical Atlas of Europe to the European Commission in Brussels on 21 September 2006.
- 2006 Completion of pilot studies for the North American Soil Geochemical Landscapes Project.
- 2006 Launch of the Geochemical Mapping Project across China and Mongolia.
- 2007 Launch of the Geochemical Atlas of Europe in Athena, Hellas, on the 23rd April 2007
- 2007 Initiation of soil sampling for the soil geochemical survey of North America, under the north American Soil Geochemical Landscapes Project.
- 2007 Completion of provisional soil geochemical mapping in India.
- 2007 National Geochemical Survey of Australia approved for funding by the Australian Government's "Onshore Energy Security Initiative".
- 2007 Publication of Geochemical Atlas of 76 Elements in south-western China.
- 2008 Compilation of the Arthur G. Darnley memorial DVD with published material of the "Global Geochemical Baselines" project, and distribution of more than 500 copies.
- 2008 Publication of a special issue of the journal *Geochemistry: Exploration, Environment, Analysis* [Vol. 8, 3/4] with the title "*Thematic set in honour of Arthur G. Darnley (1930-2006)*".
- 2008 Organisation of the Arthur Darnley Symposium entitled "*Geochemical Mapping from the Global to the Local Scale*" at the 32nd IGC, Oslo, 9 August 2008.
- 2008 Organisation of session entitled "*Soil Geochemistry: Databases and Applications at Regional to Continental Scales*" for the joint meeting of the Geological Society of America, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, and Gulf Coast Association of Geological Societies, 5-9 October 2008, Houston, Texas (USA).
- 2008 Launch of the China Geochemical Probe Project (China All-Elements Scope Project).
- 2009 Publication of the Geochemical Atlas of Italy using the FOREGS/EGS data.
- 2009 Launch of Task Group's new website at <http://www.globalgeochemicalbaselines.eu/>.
- 2009 Launch of the International Commission for the Danube River's (ICPDR) website at <http://hantken.mafi.hu/icpdr/>. 2009 Organisation of the "*Global Geochemical Mapping symposium*" in Langfang (China), 10-12 October 2009.
- 2010 Completion of soil sampling at approximately 4800 sites in the conterminous United States as part of the North American Soil Geochemical Landscapes Project.

- 2011 Completion of the Cyprus Soil Geochemical Atlas project, and publication in July 2011 of the "Cyprus Geochemical Atlas" and four technical reports.
- 2011 Publication of the EuroGeoSurveys Urban Geochemistry Book project "*Mapping the Chemical Environment of Urban Areas*" (April 2011).
- 2011 Publication of Multi-purpose Regional Geochemical Atlas of the Reaches of Yangtze and Huai River, Anhui Province, 2011, Geological Publishing House, Beijing.
- 2011 Publication of Multi-purpose Regional Geochemical Atlas of Hainan Island, Hainan Province, 2011, Geological Publishing House, Beijing.
- 2012 CGS-CCOP-IUGS/IAGC Seminar on CCOP Geochemical Mapping, Nanjing, China, 28 March 2012.
- 2012 Organisation of the 2nd Arthur Darnley Symposium entitled "*Global geochemical mapping: understanding chemical Earth*" at the 34th IGC, Brisbane, Australia, 8 August 2012.
- 2012 Participation in the IUGS Ad Hoc Review of the Task Group. Financial support provided for two graduate students to attend the 34th IGC.

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- De Vos W, *et al.* 2006. FOREGS Geochemical Atlas of Europe: Part 2 - Interpretation of Geochemical Maps, Additional Tables, Figures, Maps, and Related Publications. Geological Survey of Finland, 690p. Also available at <http://weppi.gtk.fi/publ/foregsatlas/>.

Respectfully submitted, 16 November 2012

Dr David B. Smith and Dr. Xueqiu Wang

Co-Leaders

Mr Shaun Reeder

Scientific Secretary

Mr Alecos Demetriades

Treasurer