2008 ANNUAL REPORT FOR THE INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)/ INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY (IAGC) TASK GROUP ON GLOBAL GEOCHEMICAL BASELINES

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 to prepare a global geochemical database, and its representation in map form, 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 harmonized sampling, sample preparation, quality control, and analytical protocols in geochemical mapping programs. 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 harmonization;
- 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 individual country representatives. Dr Xueqiu Wang, Chief Geochemist and Director of the Applied Geochemistry Division of the Institute of Geophysical and Geochemical Exploration, China, has recently accepted the position of co-leader of the Task Group. Dr Wang replaces Prof Jane Plant.

Steering Committee

Co-Leaders	Dr David Smith	US Geological Survey
	Dr Xueqiu Wang	IGGE, China
Scientific Secretary	Mr Shaun Reeder	British Geological Survey
Treasurer	Mr Alecos Demetriades	IGME, Greece

Analytical Committee

Chair Ms Gwendy Hall Geological Survey of 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 Prof Reijo Salminen Geological Survey of Finland

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 Geological Survey of Finland

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

Regional Co-ordination

Chair Prof Reijo Salminen Geological Survey of Finland

Co-ordinates project activities of groups of neighbouring countries and reports back to Steering Committee.

Public Relations and Finance Committee

Chair Mr Alecos Demetriades IGME, Greece

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.

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

The project does not have any other source of direct funding. However, within Europe, National Geological Surveys, and associated Institutes, have provided staff time and support to the project to complete the preparation of the European GRN as part of the FOREGS/EGS programme as an input to the IUGS/IAGC Global Geochemical Baselines project [http://www.gtk.fi/publ/foregsatlas]. A very conservative estimate of the cost for the production of the *Geochemical Atlas of Europe* is in the order of 5 million Euro (approx. 3.6 million USD). A few other countries, including China, Russia, Colombia, India, Brazil, Canada, Mexico, Nigeria and the United States have provided funds through their National Geological Surveys or related institutes for pilot studies on establishing the GRN or for national- to continental-scale geochemical mapping projects.

6. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

This project is closely associated with the work of the EuroGeoSurveys Geochemistry Working Group (previously the Forum of European Geological Surveys, FOREGS

Geochemistry Working 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 Working Group has also established closer links with the European Soil Bureau over the past few years (a Memorandum of Co-operation has been recently signed), 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 is trying to link the project 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. He is also attempting to link the project with GEOSS (Global Earth Observation system of Systems). 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).

7. CHIEF ACCOMPLISHMENTS IN 2008

Organisational Accomplishments:

A Business Meeting of the IUGS/IAGC Task Group on Global Geochemical Baselines was held at the International Geological Congress, Oslo, Norway on 8 August 2008. The minutes of the meeting are attached as Appendix 1. The contact details of all those present are given in Appendix 2.

The meeting was highly successful, enabling the Task Group to propose a new mission and discuss plans for delivering this mission and making continued progress with the project. A new organisational structure was agreed, and is in the process of being established. It takes into account one of the key recommendations of the recent IUGS Ad Hoc Review of the Task Group's activities: that the Task Group's Steering Committee should include members from outside North America and Europe. Dr Xueqiu Wang, Chief Geochemist and Director of the Applied Geochemistry Division of the Institute of Geophysical and Geochemical Exploration, China, has already accepted the position of co-leader of the Task Group, replacing Prof Jane Plant. New Continent Representatives are in the process of being appointed.

Scientific Accomplishments:

There has been continued and significant progress in a number of areas during 2008, most notably:

North America: North American Soil Geochemical Landscapes Project (NASGLP): This collaborative project between the US Geological Survey, the Geological Survey of Canada, and the Mexican Geological Survey has as its long term goals: (i) establishing a soil geochemical database and its representation in map form for the continent of North America (21 million km^2); (ii) interpreting the delineated geochemical patterns in terms of processes that caused the observed spatial distribution of the elements; and (iii) establishing an archive of samples for future investigators. In 2008, the second year of field work, about 1,800 sites were sampled. The primary samples collected at each site include a sample from

0-5 cm depth, a composite of the soil A-horizon, and a sample from the soil C-horizon. In Canada, sampling in 2008 focused on a transect extending the entire width of the country from Vancouver Island in the west to the eastern coast of Newfoundland. In the US, sampling was completed in the states of Nevada, Utah, Colorado, Wyoming, Kansas, Missouri, Arkansas, Mississippi, Louisiana, Maryland, West Virginia, Delaware, and New Jersey. In Mexico, sampling was conducted in the northern parts of the states of Baja California, Sonora, Chihuahua, and Coahuila. Details of progress with sampling on the project to date are given in Figure 1. The project convened a session at the Geological Survey of America annual meetings in Houston, Texas during October 5-9. The title of the session was "Soil Geochemistry: Databases and applications at regional to continental scales". Plans are going forward to convene a session devoted to the project at the 24th International Applied Geochemistry Symposium in Fredericton, New Brunswick, Canada in June 2009.

The decade-long project to complete the stream-sediment geochemical database for the United States is nearing completion. The database was updated in September 2008 and now contains data for more than 74000 samples. All current data from this project are available for download at http://tin.er.usgs.gov/geochem/doc/home.htm.

Asia: China and Mongolia Geochemical Mapping Project. China is cooperating with Mongolia in geochemical mapping at a scale of 1:1M covering an area of approximately one million km^2 across two countries. Agreement for this cooperative project was issued by the China Geological Survey and Mineral Resources and Petroleum Authority of Mongolia. The Institute of Geophysical and Geochemical Exploration, China, will offer help with sampling training and free chemical analysis for the samples from Mongolia. One sample per 1:25 000 map sheet (approx. 1 sample per 100 km^2) will be collected and 54 elements will be determined. Orientation mapping covering an area of 150 000 km^2 has been completed in 2008 and a manual for desert material sampling has been written based on the orientation survey. It is expected that an area of 700 000 km^2 will be finished by 2010. The preliminary results will be presented at the 24th International Applied Geochemistry Symposium in Fredericton, New Brunswick, Canada in June 2009.

China also plans to launch a very large programme named The Earth Crust Probe Programme (Sinoprobe). This includes a Geochemical Probe Project, which is an Earth science programme to explore the geochemical baselines, distribution and evolution of all elements in China's continental crust. Different kinds of typical samples, including igneous rocks, sedimentary and metamorphic rocks, soils and stream, overbank and floodplain sediments will be collected at each reference grid of 80 × 80 km. This 5-year-term project is being led by Dr Xueqiu Wang, the newly appointed co-leader of the IUGS/IAGC Task Group on Global Geochemical Baselines.

India: A low-density stream sediment geochemical survey of the Garhwal and Kumaon Himalayan region had just been completed following the recommendations of the 'Blue Book' with minor deviations arising owing to terrain condition and accessibility. Preliminary discussions for carrying out a higher density survey of India have been undertaken, and funding for a joint project with Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka under the aegis of SAARC (South Asian Association of Regional Cooperation) are being explored. Dr Xuequi Wang has volunteered to carry out additional analysis on the Indian low-density samples for free at his laboratories in China.

Australia: Sampling for the National Geochemical Survey of Australia has been initiated. This low-density survey, funded by the Australian Government's Onshore Energy Security Initiative, involves sampling catchment outlet sediments at ~1400 sites throughout the country. This represents a density of about 1 site per 5500 km^2. As of 30 September 2008, 1032 catchments (or 74%) have been sampled (see Figure 2) with sampling scheduled to be completed by June 2009. Approximately 25% of the samples have been submitted to the laboratories for total concentration analyses (by XRF and ICP-MS), partial concentration analyses (aqua regia digestion then ICP-MS), as well as some specialised analyses (F, Se, infrared spectroscopy, pH 1:5, EC 1:5, laser particle size analysis). The next tranche of 25% of the samples is being prepared at the moment (drying, disaggregating, sieving and milling) and will be submitted to the labs in January 2009. The URL for the project web site is: http://www.ga.gov.au/minerals/research/national/geochemical/index.jsp.

Brazil: The CRPM (Servicio Geológico do Brasil) has received funding to begin a national-scale geochemical mapping project. This project will involve a multi-media approach including rocks, soils, stream sediments, and ground and surface water. When possible, samples from the CRPM archives will be analysed and new samples will be collected in those parts of the country that have not been previously sampled. Sampling and analytical protocols are planned to be consistent with those recommended by the Blue Book (Darnley *et al*., 1995), with ICP-MS being the primary technique. The goal is to have one sampling station for each hydrographic basin between 1000 and 2000 km^2 in area within the Amazon region and one station in basins between 100 and 200 km^2 in area within the remainder of the country. The project is expected to begin in 2009 and sampling is planned to extend through 2012.

Europe: The two volumes of the FOREGS-EuroGeoSurveys Geochemical Atlas of Europe (Salminen *et al*., 2005; De Vos *et al*. 2006) are proving to be very popular. Both volumes are available for free download from http://www.gsf.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 EuroGeoSurveys Geochemistry Working Group, under the chairmanship of Clemens Reimann of the Geological Survey of Norway has been active in developing new scientific initiatives throughout the European geochemical community. A business meeting of the Working Group was held in Berlin on 5-7 March 2008. Minutes of this meeting are attached at Appendix 3. One of the main aims of the meeting was to finalise plans and carry out field training in the collection of samples for the GEMAS project (Geochemical mapping of agricultural and grazing land soil). This project, for which funding from Industry has been obtained, is to carry out a geochemical survey of agricultural and grazing land soils of Europe. Sampling across Europe has been largely completed during 2008. The study will provide complimentary data to that already collected in support of the Global Geochemical Baselines Project. Laboratory standard reference materials will be exchanged with the North American Soil Geochemical Landscapes Project to ensure that soil geochemical data from these two international projects are consistent and comparable.

Other related projects being undertaken within Europe by the EGS Geochemistry Working Group include preparation of an atlas of mineral water chemistry throughout Europe (as a first approximation of groundwater composition); and a study of the urban geochemistry of major European cities using a common approach. A textbook on urban geochemical sampling is also in preparation.

Public Relations Accomplishments:

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 this year has been to reorganise the Task Group's website. A contract has now been signed with a service provider in Hellas and a website name registered (http://www.globalgeochemicalbaselines.eu/). The material for the website has been prepared, and is at the final stage of editing. It is anticipated that the material will be uploaded on the website by the end of 2008. Apart from links to and from the IUGS and IAGC Websites, one of the aims is for all National Geological Surveys to have a hotlink to the Task Group's Website. It should be appreciated by the IUGS/IAGC Committees that most of the promotional work, material preparation and website design is being carried out on a voluntary basis during our personal time.

Educational material in support of the Year of Planet Earth has been prepared and we are in the process of obtaining permission from publishers to use illustrations taken from different books. The intention is for the website to represent a forum for the dissemination of information, and to make people aware of the significance that geochemical information and data have on our daily lives and the quality of the environment in which we live.

The Website hosting the Geochemical Atlas of Europe [http://www.gtk.fi/publ/foregsatlas/] is very important for the promotion of the Global Geochemical Baselines project. During the 2007 EuroGeoSurveys Directors' meeting in Athens, the Director of the Geological Survey of Finland (GTK) approved the continued maintenance of the Geochemical Atlas of Europe Website by GTK, and its updating with new information and data. 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, the Society of Environmental Geochemistry and Health.

The FOREGS/EuroGeoSurveys Geochemical Atlas of Europe is still being presented at international conferences and congresses. An important promotional activity is the CD-version of the 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. EuroGeoSurveys and national representatives have now disseminated approximately 1900 copies of the Atlas CD (1300 copies by EuroGeoSurveys office), 600 copies by the Public Relations and Finance Committee.

Another significant promotional activity undertaken in 2008 was the compilation of a memorial issue DVD to honour Arthur G. Darnley (1930-2006). The DVD included all the material from the Geochemical Atlas of Europe CD, all publications 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. The first distribution was made during the Arthur G. Darnley Symposium at the 32nd IGC in Oslo. More than hundred copies were given to

participants, and about four hundred copies were divided among members of the Task Group for distribution in their countries.

8. CHIEF PROBLEMS ENCOUNTERED IN 2008

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 has now been completed with funding by the participating European Geological Surveys. Ongoing work in North America, Australia and India, 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 web site development and workshops.

9. CHIEF PRODUCTS IN 2008

General

The major products of the Task Group during 2008 were:

(i) a special issue of the Journal *Geochemistry: Exploration, Environment, Analysis* [Vol. 8, Nos. 3/4] dedicated to the memory of the Task Group's original leader, Arthur G. Darnley (1930-2006);
(ii) the Arthur G. Darnley Memorial DVD. Approximately 1500 copies of the DVD have been produced and about 500 copies distributed up to now.
(iii) preparation of material to be uploaded on the Task Group's new website.

The electronic versions of both part 1 and 2 of the Geochemical Atlas of Europe, as well as the complete digital geochemical data and the digital photo archive have been made available at http://www.gsf.fi/publ/foregsatlas/. In addition, almost 2000 copies of the CD-version of the Geochemical Atlas of Europe have been produced by EuroGeoSurveys and the Public Relations Committee, and more than 1900 copies have been distributed.

Articles and Papers

Papers published in the special issue of *Geochemistry: Exploration, Environment, Analysis,* **8** (3-4):

Reimann C and Smith DB. 2008. Introduction. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 203-204.

Garrett RG; Reimann C; Smith DB and Xie X. 2008. From geochemical prospecting to international geochemical mapping: a historical overview. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 205-217.

Smith DB and Reimann C. 2008. Low-density geochemical mapping and the robustness of geochemical patterns. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 219-227.

Demetriades A. 2008. Overbank sediment sampling in Greece: a contribution to the evaluation of methods for the 'Global Geochemical Baselines' mapping project. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 229-239.

Cornelius M, Robertson IDM, Cornelius AJ and Morris PA. 2008. Geochemical mapping of the deeply weathered western Yilgarn Craton of Western Australia, using laterite geochemistry. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 241-254.

Zhang C, Fay D, McGrath D, Grennan E and Carton OT. 2008. Use of trans-Gaussian kriging for national soil geochemical mapping in Ireland. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 255-265.

De Vivo B, Lima A, Bove MA, Albanese S, Cicchella D, Sabatini G, Di Lella LA, Protano G, Riccobono F, Frizzo P and Raccagni L. 2008. Environmental geochemical maps of Italy from the FOREGS database. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 267-277.

Chiprés JA, Salinas JC, Castro-Larragoitia J and Monroy MG. 2008. Geochemical mapping of major and trace elements in soils from the Altiplano Potosino, Mexico: a multi-scale comparison. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 279-290.

Rapant S, Salminen R, Tarvainen T, Krčmová K and Cvečková V. 2008. Application of a risk assessment method to Europe-wide geochemical baseline data. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 291-299.

de Caritat P, Lech Megan E and McPherson AA. 2008. Geochemical mapping 'down under': selected results from pilot projects and strategy outline for the National Geochemical Survey of Australia. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 301-312.

Salminen R. Kashabano J, Myumbilwa Y, Nyanda PF and Partanen M. 2008. Indications of deposits of gold and platinum group elements from a regional geochemical stream sediment survey in NW Tanzania. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 313-322.

Pasieczna A and Lis J. 2008. Environmental geochemical mapping of the Olkusz 1:25000 scale map sheet, Silesia-Cracow region, southern Poland. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 323-331.

Xie X,Wang X, Zhang Q, Zhou G, Cheng H, Liu D, Cheng Z and Xu S. 2008. Multi-scale geochemical mapping in China. *Geochemistry: Exploration-Environment-Analysis*, 8(3-4), 333-341.

Other papers

Demetriades A, De Vivo B, Bidovec M, Lima A, Pirc S, Reeder S, Siewers U, Smith B, Albanese S, Batista MJ, Bel-Ian A, Birke M, Breward N, De Vos W, Duris M, Gravesen P, Gregorauskiene V, Halamic J, Jordan G, Lax K, Locutura J, O'Connor PJ, Pasieczna A,

Slaninka I, Tarvainen T, Gilucis A, Hayoz P, Heitzmann P, Kivisilla J, Klaver G, Klein P, Lis J, Mazreku A, Marsina K, Olsson SA, Ottesen RT, Petersell V, Reimann C, Salminen R, Salpeteur I, Sandstrom H, Selinus O, Steenfelt A, Svecova J and Taylor H. 2008. Monitoring water quality: The EuroGeoSurveys' Geochemical Atlas of Europe approach. European Geologist, 25: 5 (abstract only) [Oral presentation].

Demetriades A, De Vivo B, Ander EL, Bidovec M, Lima A, Pirc S, Reeder S, Siewers U, Smith B, Albanese S, Batista MJ, Bel-lan M, Birke M, Breward N, De Vos W, Duris M, Gravesen P, Gregorauskiene V, Halamic J, Jordan G, Lax K, Locutura J, O'Connor PJ, Pasieczna A, Slaninka I, Tarvainen T, Gilucis A, Heitzmann P, Klaver G, Klein P, Lis J, Marsina K, Mazreku A, Ottesen RT, Petersell V, Salminen R, Salpeteur I, Sandstrom H, Shaw R, Steenfelt A and Taylor H. 2008. The EuroGeoSurveys Geochemical Atlas of Europe: Stream water geochemistry. In: G Migiros, G Stamatis and G Stournaras (Editors), Proceedings 8th International Hydrogeological Congress of Greece – 3rd MEM Workshop on Fissured Rocks Hydrology. Geological Society of Greece, Athens, 1, 237-250 [Keynote presentation].

Smith DB, Goldhaber MB, and Rencz, A. 2008. Mapping the background soil geochemistry of North America. In: Sass, BM (Conference Chair), *Remediation of chlorinated and recalcitrant compounds* (Monterey, California, May 2008), Abstract H-001, CD-ROM. [Oral Presentation]

Other Presentations, Posters, Abstracts and Dissemination of Promotional Material

Abstracts of oral and poster presentations from session titled "Geochemical mapping from the global to the local scale: The Arthur Darnley Symposium" at the 33rd International Geological Congress, 6-14 August 2008, Oslo, Norway:

Posters:

Chekushin V, Selenok L, Bogatyrev I, Glavatskikh S, Salminen R, Lax K, Reimann C, Gregorauskiene V, Petersell V, Gilucis A, Golovin A and Krinochkin L. 2008. Northern Europe Geochemistry (NEG) Project—Map of ore-related anomalous geochemical fields of Fennoscandian Shield and its eastern frame at the scale of 1:5 000 000.

Cosenza A, Albanese S, Civitillo D, De Vivo B, Lima A, Macaione E and Messina A. 2008. The environmental geochemical atlas of the Natural Park of Nebrodi (Sicily, Italy).

Gordanic V, Ciric A and Jovanovic D. 2008. Geochemical investigation of radon in soil within the igneous-sedimentary complex of southern Serbia—ecological significance.

Kumar ST. 2008. Biogeochemical prospecting at Khetri Copper Deposit of Rajasthan, India.

Lech M and Caritat P de. 2008. Recent results from a geochemical survey in the New South Wales part of the Thomson Orogen in Australia: Implications for mineral exploration.

Rapant S, Salminen R, Tarvainen T, Krcmova K and Cveckova V. 2008. Application of a risk assessment method on European wide geochemical baseline data.

Salminen R, Kashabano J, Myumbilwa Y, Petro FN and Partanen,M. 2008. Indications of deposits of gold and platinum group elements from a regional geochemical stream sediment survey in north-western Tanzania.

Tomilina O, Chekushin V, Salminen R, Lax K, Reimann C, Gregorauskiene V, Petersell V, Gilucis A and Guljaeva N. 2008. Northern Europe Geochemistry (NEG) Project—Assessment of environmental status.

Oral presentations:

Bogatyrev I, Chekushin V, Salminen R, Lax K, Glavatskikh S, Reimann C, Gregorauskiene V, Petersell,V and Gilucis A. 2008. Integrated Database of Northern Europe Geochemistry (NEG) Project.

Caritat P de and Lambert I. 2008. The National Geochemical Survey of Australia: Outline and update.

Chiprés J, Salinas JC, Castro-Larragoitia J, Diaz-Barriga F, Razo I, Gamino S and Monroy M. 2008. Multi-scale geochemical mapping of soils: Natural and anthropogenic patterns from the national to the local scale.

De Vivo B, Lima A, Bove MA, Sabatini G and Frizzo P. 2008. Enviromental geochemical atlas of Italy.

Joseph M and Rout D. 2008. Geochemical mapping in the type area for laterite, Malappuram district, Kerala, India.

Morozov A , Burenkov E, Golovin A, Kremenetskiy A and Chepkasova T. 2008. Multipurpose geochemical mapping of Russia: The technology and the results.

Ogedengbe O, Arisekola T, Ayoade E, Malomo S and Abimbola A. 2008. Geochemical baseline project: A preliminary result from cell N06E04, southwestern Nigeria.

Paolo V, Marcello A. and Pretti S. 2008. Geochemical environment characterisation of Sardinia.

Prieto G, Gonzalez LM, Vargas O and Garcia GI. 2008. Geochemical atlas of Colombia, exploring the Colombian territory.

Reimann C, Garrett R, Smith D and Xie X. 2008. From geochemical prospecting to international geochemical mapping: A historical overview.

Reimann C and Salminen R. 2008. Geochemistry of Europe - the importance of sample material and scale.

Salminen R, Chekushin V, Bogatyrev I, Gilucis A, Glavatskikh SP, Golovin A, Gregorauskiene V, Mäkinen J, Petersell V, Lax K, Reimann C, Selenok L and Tomilina O. 2008. Northern Europe Geochemistry (NEG) - a metadata-base for 21 international and national regional geochemical databases.

Smith DB, Goldhaber MB, Rencz A and Salinas JC. 2008. The North American Soil Geochemical Landscapes Project.

Smith DB and Reimann C. 2008. Low-density, continental-scale geochemical mapping: Are the resulting geochemical patterns robust?

Spijker J, Van Der Veer G and Mol G. 2008. Spatial patterns of natural variation, anthropogenic impact, and chemical reactivity in Dutch soils.

Dantu S. 2008. Regional geochemical baseline mapping in Medak district, Andhra Pradesh, India.

Wang X. 2008. Multi-scale geochemical mapping in China.

Abstracts of oral and poster presentations from session titled "Soil Geochemistry: Databases and Applications at Regional to Continental Scales" at the 2008 Joint Annual 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):

Posters:

Adcock SW, Laframboise RR, Spirito WA and Grunsky EC. 2008. Managing geochemical data—Development of an appropriate database and delivery mechanism.

Calleja A. 2008. Soil geochemistry along a transect from Cedral, San Luis Potosi, to Tecpán, Guerrero, Mexico.

Ford K and Chen J. 2008. Studies of natural radioactivity related to the North American Soil Geochemical Landscapes Project.

Friske PWB, Kettles IM, Garrett RG and Grunsky EC. 2008. Sampling, analytical and data handling protocols for the North American Soil Geochemical Landscapes Project.

Garrett RG. 2008. Establishing background values in geochemical data: Open source R language tools.

Garrett RG, Grunsky EC and Friske PWB. 2008. Comparison of soil data obtained using aqua regia variants on 8 standard reference materials.

McNeil RJ, Friske PWB and McCurdy MW. 2008. Applications of tri-national project data: Comparing tri-national data for soils with data for stream waters and sediments in the Maritimes, Canada.

Morman SA and Smith DB. 2008. Application of physiologically based extraction tests to evaluate metal bioaccessibility in a continental-scale soil geochemical survey.

Tellez JI. 2008. Proposal to evaluate bioaccessibility and mobility of elements of environmental concern in collected samples from the North American Soil Geochemical Landscapes Project.

Oral presentations:

Chiprés JA, Monroy MA, Jiménez F, Hernández MC, Tellez JI, Cruz O and Salinas JC. 2008. Characterization of regional geochemical anomalies within the continental-scale pilot transect in Mexico.

Goldhaber MB, Morrison JM, Holloway JM, Wanty RB and Smith DB. 2008. A regional soil and sediment geochemical study in northern California.

Goodwin TA, Parkhill MA, Pronk AG, Desrosiers M and Boldon R. 2008. Variation in soil geochemistry across the Maritime Provinces, Eastern Canada.

Grunsky EC and Garrett RG. 2008. Establishing background values in geochemical data.

Hernández MC, Chiprés JA, Castro GJ and Monroy MG. 2008. Soil geochemical mapping with environmental and health perspectives in the region of San Luis de al Paz, Mexico.

Kettles IM, Friske PWB, Hall GEM, Garrett RG, Smith DB and Woodruff LG. 2008. Importance of consistent protocols for national and international projects.

Klassen RA. 2008. What's in a number? Interpretation of geochemical analyses for environmental and human health protection.

Morrison JM, Goldhaber MB, Lee L, Holloway JM, Wanty RB and Ranville JF. 2008. A regional-scale study of chromium and nickel in soils of northern California.

Reeves JB III and Smith DB. 2008. Potential of mid- and near-infrared diffuse reflectance spectroscopy for determining major- and trace-element concentrations in soils from a geochemical survey of North America based on a continental-scale transect.

Rencz AN and Mroz R. 2008. Applications of tri-national project data to human and ecological risk assessment.

Smith DB, Rencz AN and Salinas JC. 2008. The North American Soil Geochemical Landscapes Project: Overview, goals, progress.

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The EuroGeoSurveys Geochemical Atlas of Europe CD was distributed to participants of the 26th European Conference of the Society for Environmental Geochemistry and Health, which was co-organised in Athens (31 March to 3 April 2008) by the Institute of Geology and Mineral Exploration and the University of Athens.

The Arthur G. Darnley memorial DVD and copies of the special Issue of *Geochemistry: Exploration-Environment-Analysis* (Vol. 8, Nos. 3-4) were distributed to participants of the Arthur Darnley Symposium (9 August 2008).

It is stressed that the posters and presentations prepared on behalf of the EuroGeosurveys Geochemistry Expert Group all bear the IUGS, IAGC and Planet Earth logos in addition to the logo of EuroGeoSurveys and any national logos.

10. SUMMARY OF EXPENDITURES IN 2008

The Task Group has received 1500 USD from IUGS in 2008. This amount is very small for the planned promotional activities, and even for assistance to developing country participants. It was decided, therefore, to keep it for future small promotional activities, and in the hope that IUGS will approve the requested amount.

The cost of the EuroGeoSurveys programme over the past year is estimated to be in excess of US $45,000. The overall cost of the FOREGS/EGS 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 $10M. These funds were provided from the Geological Surveys of the participating countries within Europe. The cost of pilot studies in the US and Canada for the proposed soil geochemical survey of North America is estimated to have been approximately US $0.5M in 2007 and approximately US $1.6M over the 3-year pilot phase of the project. Total costs for carrying out the soil geochemical survey of North America are estimated to be US $15-20M over the next ten years. There has also been considerable expenditure within India, China, Australia and Brazil.

It should be mentioned that for promotional activities, the cost for the production of 1500 copies of the Arthur Darnley Memorial DVD was 1300 Euro (approx. 2000 USD), and the hosting of the Task Group's Website was 100 Euro (approx. 150 USD).

11. WORK PLAN FOR NEXT YEAR

The next business meeting of the Task Group will take place in 2009. It will either be timed to coincide with the EuroGeoSurveys business meeting scheduled for spring of 2009 or an international geochemical baselines mapping conference due to be hosted by Prof Xie Xuejing in Beijing next May. The next meeting of the Task Group will consider details of issues raised at the 2007 business meeting arising from the agreed change in direction, including establishment of the Continent Representatives, database management,

stipulations for the Task Group being able to award the 'seal of approval', etc.

The Task Group's Data Management Committee is planning a workshop in Athens (Hellas) to organise the structure of a geochemical metadatabase similar to the North European metadatabase, which is located at www.noreurgeoch.net.

The immediate priority for the Task Group for 2009 will be to pursue opportunities within Africa and the CCOP countries. This will be very much dependant on securing appropriate funds from IUGS (see section 13).

The revision of the FOREGS Geochemical Mapping Field Manual (Salminen *et al*., 1998) has started, and will be completed at the beginning of 2009. It will include new details on sampling in karstic terrains, prepared by A Demetriades, S Pirc, M Bidovec and F Sustersic, and other key terrains, such as tropical, desert and arctic.

The Task Group's Analytical committee will consider a proposal for the exchange of laboratory standard reference materials and a small number of samples from some large national and international projects to ensure that geochemical data from these projects are consistent and comparable.

The activities of the EuroGeoSurveys Geochemistry Working Group, under the chairmanship of Clemens Reimann, will continue with the preparation of the soil samples collected for the "*Geochemical Mapping of Agricultural and Grazing Land Soil*" project and the start of chemical analyses. The chemical analysis of the bottled mineral water samples for the EuroGeoSurveys "*European Groundwater Chemistry*" will be completed in 2009, and processing of the data will start.

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. Communication will also be achieved through continued output of peer-reviewed scientific papers, oral presentations, posters and promotional materials.

In addition, a new version of the Task Group's website is in the late stages of development and will be the key forum for communication and dissemination.

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. This funding has come primarily from national geological surveys and other scientific institutions in participating countries. For example, the North American Soil Geochemical Landscapes Project, funded primarily by the U.S. Geological Survey, the Geological Survey of Canada, and the Mexican Geological Survey, spent well over US $1M in 2008 to collect and analyse soil samples from about 1800 sites in North America. A similar expenditure is expected in 2009 and for several years beyond. Anticipated expenditures in Europe for the GEMAS project are estimated to be in excess of US $1.2M over 4 years, approximately half of which

will be provided from industry. Ongoing national-scale geochemical surveys in Australia, Brazil, China, and India are funded in a similar manner. We conservatively estimate that over the past ten years, US $30M 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 and 2004-2008. This funding has been used for promotional purposes such as the DVDs distributed at the 33rd IGC. 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. While this funding is greatly appreciated, it is barely enough for the Task Group to function as a viable entity within IUGS and IAGC. The IUGS ad-hoc review committee, led by Prof. Ryo Matsumoto of the University of Tokyo, recommended in their 2008 report that funding from IUGS to the Task Group be increased to US$5000 per year for routine operations of the Task Group such as maintenance of the web site and preparation of educational materials. This review committee also recommended that IUGS provide occasionally an influx of about US$25000 to the Task Group for the purpose of holding workshops in African and Asian countries to promote the establishment of international-scale geochemical mapping projects similar to that conducted from 1995-2005 by the Forum of European Geological Surveys.

The Task Group appreciates the recognition by the review committee for the need of this additional funding and we have plans to use this increased amount to hold training workshops in south-east Asia, India, or Africa in 2009 or 2010. With this report, we formally ask the IUGS Executive Committee to consider the review committee's recommendation for this increased funding and officially request US$30000 in 2009. A similar request was turned down in 2008 because of IUGS commitments to IGC. We ask for reconsideration in 2009. Our Public Relations and Finance Committee will continue to seek funding from other sources, but this has proven to be most difficult.

14. CHIEF ACCOMPLISHMENTS 1998-2008

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 Annual Meeting was held in Naples, Italy (1-3 October 1998) in conjunction with the FOREGS Geochemistry Working Group Annual Meeting.
1998 European GRN sampling programme commenced.
1999 Completion of pilot study for geochemical mapping carried out in Colombia.
1999 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.
1999 Launch of the south-western China Geochemical Atlas of 76 Elements Project.
2000 Symposium on geochemical baseline activities was organised as part of the 31st International Geological Congress in Rio de Janeiro.
2000 First draft of promotional papers to possible sponsors prepared and sponsorship campaign commenced.

2000 Annual Business Meeting of the IUGS/IAGC and FOREGS Working Groups held in Athens, Greece (14 to 17 November).
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 Annual Business Meeting of the IUGS/IAGC and FOREGS Working Groups held in Svincice, Czech Republic (22 to 25 April 2002).
2002 Sampling and analysis completed in Southern India. Pilot studies partially completed within Colombia and Brazil. A major new campaign under the auspices of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia is currently in the planning stages.
2003 Annual Business Meeting of the FOREGS Working Group held in Dublin, Ireland (18 to 21 March 2003).
2003 Quality control of the analytical results of the FOREGS project completed.
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 Annual Business Meeting of the IUGS/IAGC and FOREGS Working Groups held in Edinburgh, Scotland (9 September 2003).
2003 Launch of North American Soil Geochemical Landscapes Project.
2003 Launch of geochemical baseline mapping programme in India.
2004 IUGS/IAGC/FOREGS Working Groups' workshop (DW016) at the 32nd International Geological Conference, Florence, Italy, 20-28 August 2004, held on 22 August 2004.
2005 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.
2006 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 Distribution of more than 1300 copies of the CD-version of the Geochemical Atlas of Europe.
2007 921 copies of Part 1 and 740 copies of Part 2 of the Geochemical Atlas of Europe have been sold to date, and more than 100 copies of the two-volume set have been donated to libraries of educational establishments and institutions.
2007 Data downloads from the website as of September 2007: 255 for the stream water data set, and 239 for the topsoil.
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 Distribution of more than 500 copies of the CD-version of the Geochemical Atlas of Europe.
2008 Compilation of the Arthur G. Darnley memorial DVD with published material of the "Global Geochemical Baselines" project.
2008 Publication of a special issue of the journal *Geochemistry: Exploration, Environment, Analysis* [Vol. 8, Nos 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, Saturday 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).

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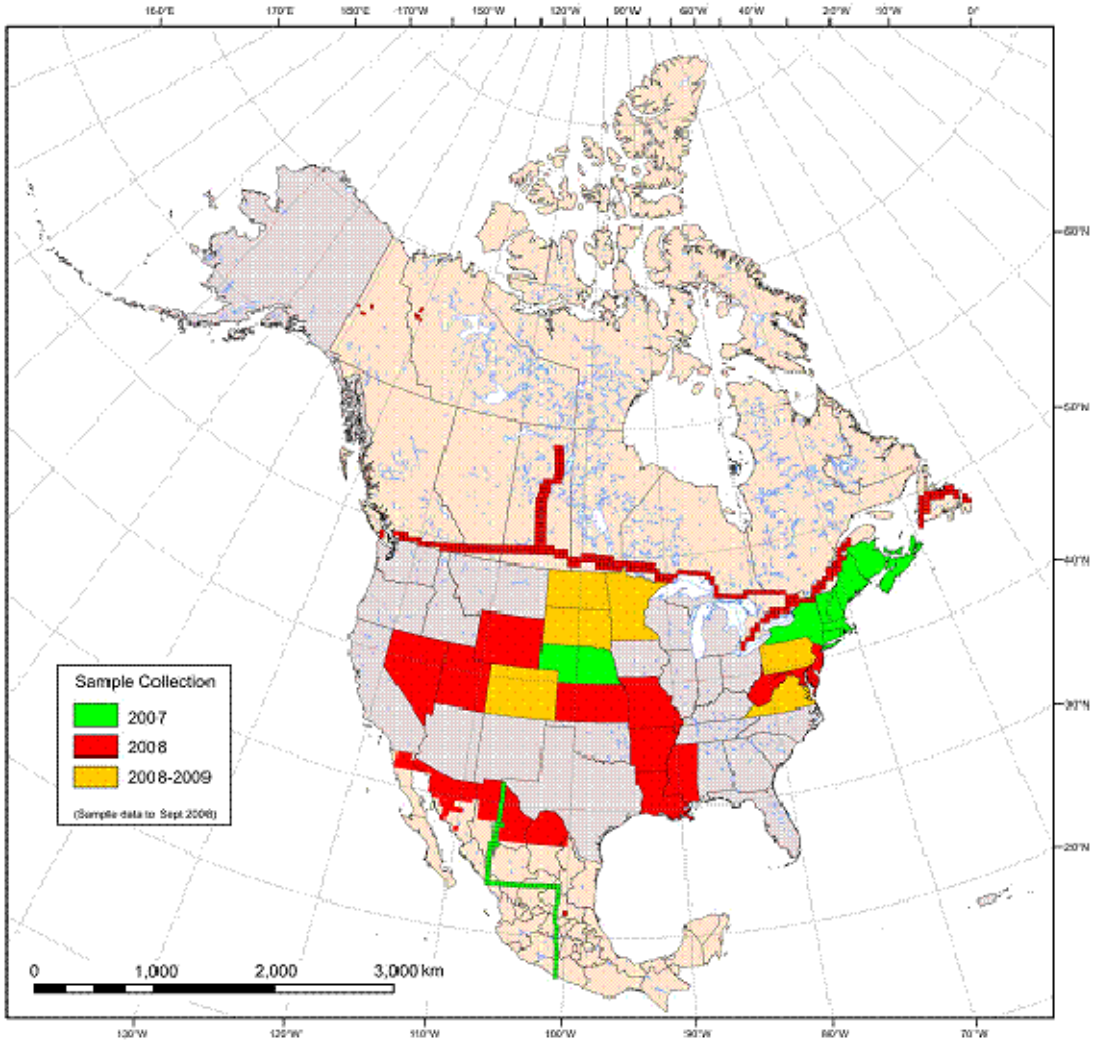

Figure 1 Progress to date and projected for 2008-09 on the North American Soil Geochemical Landscapes Project (NASGLP).

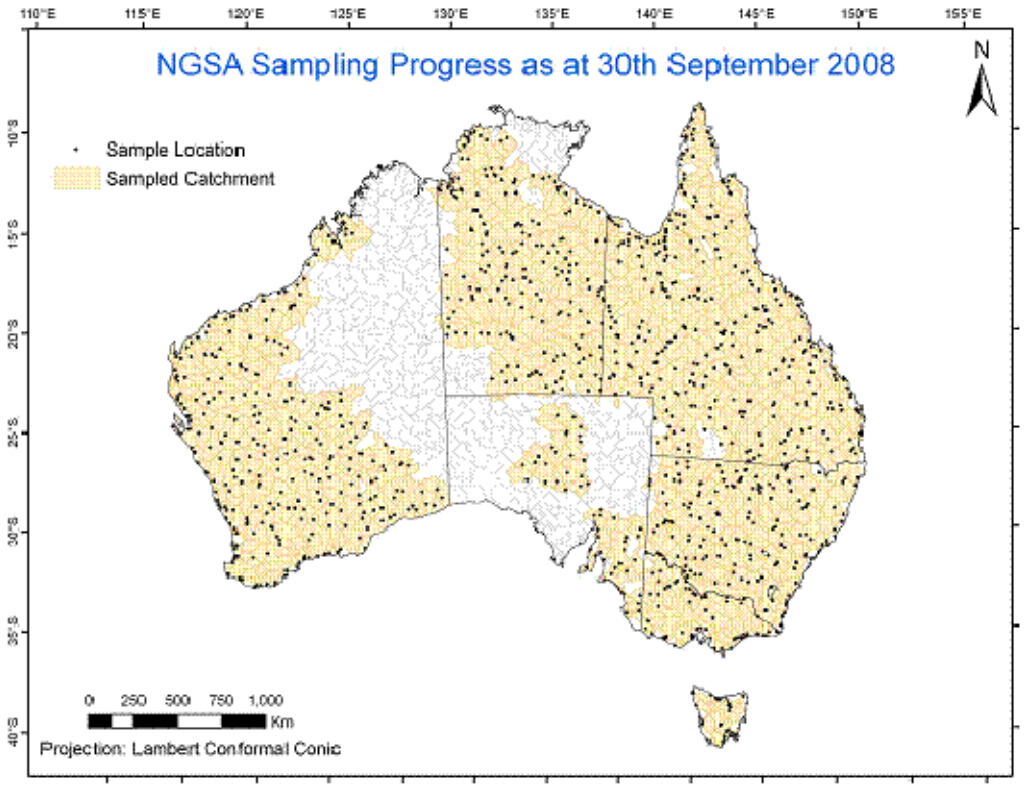

Figure 2 Progress to date on the National Geochemical Survey of Australia