

Use of GIS greatly enhances the ability of managing and representing large amounts of geochemical data. This project is part of a broader one, hopefully to be started in the near future, aimed at the compilation of environmental geochemical maps covering the whole Italy with the same sample density used for the Campania region. To compile the maps of the geochemical atlas of Campania we applied a recently developed mapping technique (using the custom software GeoDAS), which combines the IDW interpolation of data with a fractal filtering algorithm. Campania extends over 13,600 km², and includes part of the Apennine Chain mountains, oriented roughly NW-SE, in the eastern sector, and the coastal plains of the Volturno and Sele rivers, in the western sector. Apennine is made up mostly of limestones, dolostones, siliceous schists and terrigenous sediments. Volcanic rocks (age from ~ 600 ka to present) are found in the western sector and are potassic/ultrapotassic lavas and pyroclastics of different centers (Campanian Ignimbrites, Mt Somma-Vesuvius, Campi Flegrei and Ischia). Stream sediments (2389 samples) were sampled with a density of 1 sample per 5 km². We also measured pH, conductivity, partial and total radioactivity using a portable Scintrex GRS-500. All stream sediments were sieved and the <150 µm fraction was retained to be analyzed for 37 elements (Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sc, Se, Sr, Te, Th, Ti, Tl, U, V, W and Zn) by ICP-MS. Analytical data were stored in a georeferenced database and processed using GeoDAS. We produced for each element: a) dot map, representing samples location and elemental concentration; b) IDW multifractal interpolation map, representing areal interpolated data; c) background map, representing regional distribution of estimated background concentration values; d) anomaly map, representing regional distribution of estimated anomaly values. Elaboration of the data by IDW multifractal method also included the creation of: 1) maps of the distribution of association factor scores from R-mode factor analysis; 2) maps representing ⁴⁰K, ²³²Th and ²³⁸U and total radioactivity distribution; 3) risk maps for 7 toxic elements.

DWO 16-18 FOREGS ITALIAN GEOCHEMICAL BASELINE MAPPING

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Goal of FOREGS project is to realize in Europe a systematic baseline environmental mapping as a means of monitoring the state of the environment and identifying anomalous areas. Unlike other countries, where the project has been carried out by national Geological Surveys, in Italy it was not feasible due to the fact that Italy's Geological Survey lacks both the personnel and the funds required to undertake such a task. For this reason the Italian territory is being covered by the work of three University research teams based in Napoli, Padova and Siena. However, funds for the analytical costs have been, at least partially, supplied by a CNR Progetto Strategico (1997-1999). Only 7 of the 26 GRN cells in Italy had the requisite to be sampled as dictated by FOREGS guidelines (i.e., samples of 7 different media taken in 5 random sampling sites in each cell). These cells have been sampled as follows: 3 in northern Italy (Padova University), 2 in central-northern Italy (Siena University) and 2 in central-southern Italy and islands (Napoli University). In other 13 Italian cells (12 in southern Italy and islands, sampled by Napoli University, and 1 in northern Italy, sampled by Genova University), samples have been collected in one or two sites per cell due to the fact that most of the cell surface was occupied by the sea. In each sampling site 7 types of samples have been taken: stream water, stream sediments, overbank and floodplain sediments, top and bottom soils, humus. Collected samples, after being prepared at Geological Survey of Slovak Republic (GSSR), have been analyzed with different techniques (ICP-MS, TOC/ions, XRF, ICP-AES, etc.), following FOREGS guidelines in different European Geological Surveys laboratories (BGR, NITG-TNO, BGS, GTK, BRGM, MAFI, PIG and NGU). Upon publication of Europe geochemical atlas by FOREGS, the geochemical maps of Italy obtained from the single sampled media will be published along with a report describing the geology, the soil profiles, the stream and overbank/floodplain sediments of each sampled site. Maps and attached report will be supplied with a database containing all the analytical data and made available to the scientific community and Authority interested to gain access to environmental geochemical data of the entire Italian territory.

DWO 16-19 GEOCHEMICAL ENVIRONMENTAL ATLAS OF THE VOLCANIC SOILS OF ISCHIA ISLAND (NAPLES, ITALY)

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It has been compiled the environmental geochemical atlas of the volcanic soils of Ischia, a volcanic island with an extension of 46 Km² located in the Pozzuoli Gulf, 5 Km southwest of Campi Flegrei.

A total of 198 residual soil samples have been collected during the spring of 2001 (between 5 and 15 cm below the surface) with a sample grid of 500 x 500 m. Soil samples have been dried in air and sieved; the <150 µm fraction has been analysed (after aqua regia digestion) by ICP-AES for 35 elements (Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sr, Te, Th, Ti, Tl, U, V, W, Zn). Using a portable Scintrex GRS-500 radioactivity was measured at each sample site, covering the entire studied area.

The Atlas, compiled using GeoDAS and ArcView GIS softwares, contains: 35 dot maps showing the real chemical concentration of each analysed element; 35 geochemical maps of interpolated data distribution using a multifractal approach; 35 baseline and anomalies maps obtained using a fractal filtering technique; 13 intervention maps for some selected elements (As, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Ti, V, Zn) using the concentration limits established by Italian Law (D.M. 471/99); 5 maps for the regional variability of factor scores of elemental associations resulting from R-mode factor analysis; 5 maps showing total and partial (⁴⁰K, ²³²Th, ²³⁸U) radioactivity values distribution.

Geochemical distribution and intervention maps show high concentrations for some elements (As, Hg, Mo, Pb, S, Ti) around Casamicciola and Maronti being mostly of geogenic sources due to the existence of fault and fracture systems. These represents the preferential outflow routes controlling the circulation of metal bearing hydrothermal fluids. Only in the area around Barano the high Cu concentrations could have an anthropogenic source (agriculture), while Pb and Zn abundance in the mostly populated areas are certainly due to motor vehicles traffic.

DWO 16-20 GLOBAL GEOCHEMICAL BASELINE MAPPING IN INDIA

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As a part of IUGS/IAGC Global Geochemical Baselines Program, a multi-institutional Working Group in India has been formed to carry out geochemical baselines mapping for the whole country. National Geophysical Research Institute (NGRI), Hyderabad has been identified as the Nodal Agency to coordinate baseline mapping in India. The main aim of these studies is to provide multi-media and multi-elemental baseline data for a wide range of environmental and mineral resources applications. The data will provide base against which man-made pollution can be measured. It will also help the policy makers for planning the new industrial areas, land use, agriculture and limits of contamination in soil.

Preliminary studies were carried out in some parts of Southern India by NGRI and now detailed studies have been initiated with the help of some universities for carrying out sampling in close grid pattern. Stream water, stream sediments, top and C-horizon soil samples are collected from different cells of 160 x 160 sq. km. The field procedure manual (Green book) prepared by Geological Survey of Finland is followed for collection of different kind of samples. The Working Group in India has decided to collect the samples of different media at more than five sites and it is planned to collect from 64 sites from each cell.

NGRI has carried out geochemical baseline studies in Cauvery Basin as a pilot project. 800 soil samples were collected and analyzed by XRF Spectrometer for 23 elements. Geochemical distribution maps for the area have been prepared. Collection of samples in South India is in progress. Geochemical baseline studies carried out in different parts of India will be presented in this paper along with the future programme for the country.