4.7.P04

Geochemical mapping in the Romagna Apennines, northern Italy

E. DINELLI AND F. LUCCHINI

[1] Dipartimento di Scienze della Terra e Geologico-Ambientali, Università di Bologna; dinelli@geomin.unibo.it; lucchini@geomin.unibo.it

A low density stream sediment geochemical survey (1 sample per 8 km^2) has been conducted in the Romagna Apennines, between Bologna and Rimini, northern Italy. The geology of the area is dominated by sedimentary rocks. The thick Miocene Marnoso-arenacea Formation, a siliciclastic unit with variable carbonate content, forms the backbone of the mountain chain in this area. Localized thin Messinian gypsum outcrops and Pliocene-Pleistocene marls, clays and sandstones are found closer to the lowland areas. The boundaries between the major geological and lithological units are broadly oriented NW-SE. In the westernmost part of the studied areas, and with a NE-trending tectonic boundary, chaotic clays with extensive outcrops of quartz-rich and carbonatic sandstones and limestones are present.

Active bedload stream sediments were collected and sieved in the field to retain the 80 mesh sieve (<177 μm) fraction between 1998 and 2003. This fraction was processed and analysed for some 30 elements by X-ray fluorescence spectrometry.

The major geological units are clearly identified on the basis of the spatial distribution of major elements. The westernmost area is generally characterized by high Al_2O_3, SiO_2, K_2O, Fe_2O_3, except for the areas where carbonate-bearing rocks occur. One interesting result is the recognition of several sub-areas within the apparently homogeneous Marnoso-arenacea formation: i) high SiO_2 in the highlands close to the mountain divide and where the abundance of coarse-grained material increases; ii) a broad belt with high CaO and comparatively low values of all the elements related to the silicate fraction; and iii) a belt with high values of MgO, related to increase in the occurrence of dolomite in the sediments, which has been related to a change in the provenance of sediments [1] occurring in the late depositional stages of the Marnoso-arenacea Formation.

The effects of human activities are evident from the geochemical maps of Cu, Zn and Pb that show scattered anomalies localized close to the largest villages along the valleys. Ancient sulphur mines, widespread in the eastern part of the studied area, are marked by anomalous levels of S, Sr and Ba elements enriched in the mine waste material.

References

[1] Gandolfi G., Paganelli L., and Zuffa, G.G. (1983) *J. Sediment. Petrol.* **53**, 493–507.

4.7.P05

Geochemical environmental maps of soils of Campania Region urban areas, Italy

B. DE VIVO B.[1], A LIMA[1], S. ALBENESE[1], D. CICCHELLA[1,2], L. FEDELE[1] AND P. FRATTINI[1]

[1]Dip. Geof. Vulcan., Univ. Napoli 'Federico II', Via Mezzocannone 8, 80134 Napoli, Italy; bdevivo@unina.it

[2]Dip. Studi Geol. Amb., Univ. Studi del Sannio, Via Port'Arsa 11, 82100 Benevento, Italy

Environmental geochemical atlases are being compiled for 5 metropolitan areas (Napoli, Avellino, Benevento, Caserta and Salerno) of Campania Region on the basis of surficial soils, collected at depths between 5 and 15 cm. A total of 870 soil samples were collected over an area of about 400 km^2, on a 0.5 x 0.5 km grid in urbanised areas and a 1 km x 1 km grid in suburban areas. Each sample was digested in Aqua Regia and analysed by ICP-MS or ICP-ES for 40 elements (Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, La, Mg, Mn, Mo, Na, Ni, Os, P, Pb, Pd, Pt, S, Sb, Sc, Se, Sr, Te, Th, Ti, Tl, U, V, W, Zn). Precision was calculated on 25 in-house replicates and 20 blind duplicates submitted by the authors. Accuracy was estimated using an laboratory in-house reference material, DS3. Radioactivity measurements were carried out at all 870 sites using a portable Scintrex GRS-500 spectrometer. Data for elemental concentration values were evaluated using standard statistical procedures such as histograms, cumulative frequency and probability plots. R-mode factor analyses were carried out to identify significant elemental associations.

For each city, maps were compiled for 40 elements and variables to illustrate the distribution of single elements, interpolated data, regional baseline, and anomalous values, as well as 5 R-mode factor score maps of elemental associations, 13 land use maps for selected elements (As, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, V, Zn) following the intervention criteria established by Italian Law (D.M. 471/99), and 5 maps of radio-element distribution. For the interpolated geochemical maps, a recently developed multifractal IDW interpolation method was applied, together with a fractal filtering technique using the new GeoDAS software.

The geochemical maps show areas with high concentrations of elements that are potentially hazardous to the environment (Pb, Zn, Cu, Sb, Ag, Au, Hg etc.). The contamination is likely due to both to motor vehicles and industrial plants. Risk areas identified using the intervention criteria for residential/recreational and commercial/industrial land uses esablished by Italian Law D.M. 471/1999, are situated mostly around highly trafficated residential areas and in industrial areas.