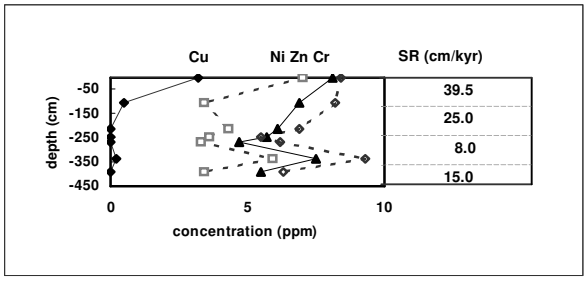
4.65.P03

Heavy metals chronological and areal trends of shelf marine sediments in Central Tyrrhenian Sea (Tuscany-Italy)

L. CONFORTO AND L. MANFRA

Department of Earth Sciences, Rome University "La Sapienza", p.le Aldo Moro 5, 00185 Rome, Italy (luisa.conforto@uniroma1.it)

Heavy metals variations from the Last Glacial Maximum (LGM) to about 1000 years BP and their present distribution are investigated. Heavy metals (Fe, Mn, Pb, Zn, Cu, Cd, Ni, Co, Cr) of shelf marine sediments, sampled in an area where only poor data are available, near the Uccellina National Park (Southern Tuscany), are analysed using an ICP AE spectrophotometer. Samples were collected during an oceanographic drilling project in the submerged Ombrone river delta area in the 1994 to 1996. Paleoenvironmental conditions are investigated on 6 cores, dated by Radiocarbon LSC and AMS analyses [1]. The last 50 years concentrations trends and areal distributions are measured in 12 box cores, dated by ^{137}Cs and ^{210}Pb [2]. In the figure some metal concentrations and sedimentation rates (SR) are plotted. Analyses are performed on a core now located at about 22 Km SW off the Ombrone delta, at 150 m water depth. In the LGM, because of the sea level variation, parameters were about 7 Km and 30 m, respectively. Generally, concentration trends vary according to SR. This feature can be explained in glacial times by the river mouth proximity to the sample location and, from the onset of the Holocene, by the enhanced river supply, according to paleoenvironmental conditions.



Box cores data show that present elements values are almost similar to geological ones, the only difference concerning the Mn trend, sharply increasing from '70s. This feature, of anthropic origin, is probably due to the growth in fungicide and animal feed employment. These results, showing only little anthropic pollution, agree with the WWF reports, and confirm the Uccelina National Park fair conditions.

References

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4.65.P04

Chemical and isotopic signatures of groundwater in the Guanajuato Mining District, Central Mexico: Natural vs. anthropogenic sources of heavy metals

A. CARRILLO-CHÁVEZ[1], O. MORTON[2], P. MORALES[3], E. CIENFUEGOS[3], E. GONZÁLEZ-PARTIDA[1], H. RIVAS[4], A. CAMPRUBÍ[1], J. TRITLLA[1] AND G. LEVRESSE[1]

[1] Geofluidos, Centro de Geociencias, UNAM, Campus Juriquilla, A.P.15, Juriquilla, Querétaro 76230, México (ambiente@geociencias.unam.mx)
[2] Instituto de Geofísica, UNAM, Mexico
[3] Instituto de Geología, UNAM, Mexico
[4] Instituto de Geografía, UNAM, Mexico

The Guanajuato Mining District has been exploited for silver and gold in low-sulfidation quartz- and calcite-rich epithermal veins since 1548. Currently, there are about 150 million tonnes of low-grade ore piles and mine-waste material (mostly tailings) piles around the city of Guanajuato. There is public concern about possible contamination of the local aquifer with heavy metals (Fe, Mn, Zn, As and Se) derived from the mining activities.

Experimental and field data from this research provide geochemical evidence that most of the mine-waste materials derived from the exploitation of the epithermal veins of the region have very low potential for generation of acid mine drainage due to the high carbonate/sulfide ratio (12:1), and very low potential for leaching of heavy metals into the groundwater system. Furthermore, geochemical evidence (experimental and modeled) indicates that natural processes, like metal adsorption onto Fe-oxy-hydroxides surfaces, control the mobility of dissolved metals.

Stable isotope data from surface water, groundwater wells (150-m depth) and mine-water (300- to 500-m depth) define an evaporation line ($\delta D = 5.93\ \delta^{18}O = 13.04$), indicating some deep infiltration through a highly anisotropic aquifer with both evaporated water (from the surface reservoirs) and meteoric water (not evaporated). Zinc concentrations in groundwater (0.03 to 0.5 ppm) of the alluvial aquifer, some 15 km from the mineralized zone, are generally higher than Zn concentrations in experimental tailings leachates that average less than 0.1 ppm. Groundwater travel time from the mineralized area to the alluvial valley is calculated to range from 50 to several hundred years. Thus, although there has been enough time for Zn sourced from the tailings to reach the valley, Zn concentrations in valley groundwater could be due to natural dissolution processes in the deep portions of the epithermal veins.