Reconnaissance study of heavy metals in surface sediments from the Southern Black Sea Shelf and upper slope

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A wide variety of sediment types (mud to sandy gravel) was obtained at fourty-seven stations on the Southern Black Sea shelf and upper slope and analyzed for their heavy metal geochemistry. Distribution of grain size, carbonates, organic carbon, and heavy metals show marked changes in the topography-related hydrography, biological activity, and land-geology of the region studied.

Sediments constitued up to 39% $CaCO_3$ mainly of biogenic origin from the shell remains of benthic organisms. Organic carbon contents of the sediments (0.13-3.09%) usually reflect the prevailing high primary productivities in the Black Sea although significant terrigenous influences are also inferred. The effects of both water currents and benthic activities on the grain size of sediments appeared to be important especially in the vicinity of Bosphorus Strait.

The heavy metal concentrations (Fe: 0.23-4.90%; Mn: 112-1064 ppm; Co: <1-20 ppm; Cr: 13-224 ppm; Ni: 11-202 ppm; Cu: 15-82 ppm; Zn: 24-138 ppm; Pb: 12-66 ppm) largely indicate the influences from the naturally-occurring geological sources delivered via river runoff and coastal erosion. In comparison with the average sedimentary rocks and other modern sediments from the adjacent regions YUCESOY and ERGIN, 1991, and many other references therein), the concentrations of Cr, Ni, Cu, Zn, and Pb are somehow higher in the surface sediments from Southern Black Sea. In particular, Cr (Fig. 1), Ni and Cu (Fig. 2) are found in high abundances in the Eastern parts of the study area. This is thought to reflect not only the well-mixed fine-grained nature of the sediments but also the possible contribution from metal-rich rocks (mafic and ultramafic sources) and associated economic mineral deposits in the catchment areas of rivers which drain this part of the coast. The presence of significant positive correlations between the concentrations of Cr and Ni, and Zn and Pb (Fig. 3) strongly suggest common sources and/or similar enrichment mechanisms for these metals. The relationships among the geochemical variables revealed that Fe, Mn, and organic phases together with the clay- and silt-sized grain fractions are the important associations of the studied heavy metals. Heavy metal data indicate that there is no significant anthropogenic contribution to the bottom deposits.

Fig. 1. Distribution of Cr in surface sediments along the Southern Black Sea Margin.

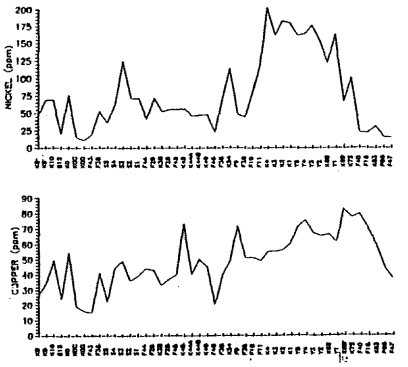

Fig. 2. Distribution of Ni and Cu in surface sediments along the Southern Black Sea Margin.

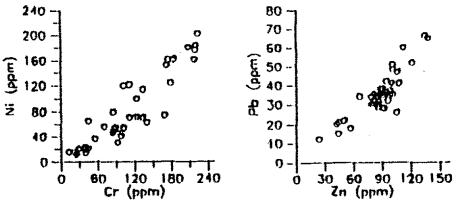

Fig. 3. Relationship between the concentrations of Cr and Ni, and Zn and Pb in surface sediments along the Southern Black Sea Margin.

REFERENCES

YUCESOY F. and ERGIN M., 1991.- Heavy metal geochemistry of surface sediments from the Southern Black Sea Shelf and upper slope. Manuscript submitted to Chemical Geology.