



Heavy metal contamination and bioproductivity record in box-core sediments from the Strait of Sicily, central Mediterranean

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Although a considerable number of investigations have been carried out on trace metal distribution within the western Mediterranean basin, many on dissolved concentrations, some on marine organisms from selected locations, concentrations of some toxic elements (e.g. Hg, Sb, and V) in recent sediments remain poorly documented. Results obtained from a geochemical high-resolution study performed on box-core sediments from the Strait of Sicily permitted to reconstruct the spatial and temporal distribution of major and trace elements. Sediments were collected during oceanographic cruises onboard the Research Vessel "URANIA" in the summers 2001/2002/2003 along three onshore-offshore transects in front of the towns of Sciacca, Gela, and Pozzallo. The cores have been sub-sampled at high resolution with an interval of 1 cm and analysed by XRF to determine major and trace-element concentrations and by XRD to define bulk mineralogy. CaCO₃ contents have been determined by a calcimeter. The dating of sediments has been obtained by measuring radiometric activity of ²¹⁰Pb by alpha spectrometry. Samples have been processed by digestion with *Aqua Regia* and then analysed with ICP-MS (ELAN Perkin-Elmer mod. 6000) to determine "pseudo-total contents" of As, Cd, Cu, Cr, V, Pb, Zn, Co, Sb, Mn. Hg concentrations have been determined by Advanced Mercury Analyser (AMA mod. 254) spectrophotometer for single mercury. In order to estimate the relationship between organic carbon and heavy

metals, analysis of TOC were carried out by Gaschromatography. Most samples generally display Ti/Al and K/Al ratio values around 0.06 and 0.02, respectively, that are consistent with riverine and aeolian detrital sources from surrounding land. Deviation from these values might reflect high energy depositional environments. High Ba_{excess} values measured at some stations are consistent with the presence of an important upwelling system in the studied area, particularly evident in the Adventure Bank. Application of different statistical algorithms highlights a geochemical spatial variability along the Sciacca-Pantelleria transect that reflects the irregular morphology of the Adventure Bank. Moreover, the statistical approach permitted to discriminate different sources for Cr, Cu, Co, V, and Zn inferred to be essentially lithogenic and for Sb, Cd, As, Pb, and Hg thought to be partially derived from anthropic contributions. Based on ^{210}Pb chronology, the vertical distribution of heavy metals in the cores clearly records the effects of industrialization, agricultural activities, and urbanization that affected the southern coast of Sicily since the beginning of the 20th century, with an evident enhancement starting around the 1960s. Some variations of major and trace element amounts are interpreted as an effect of geothermal and/or magmatic activities in the Strait of Sicily. To compensate carbonate and organic carbon dilution, trace metal concentrations have been normalized to Al assumed to be prevalently bound to aluminosilicate minerals. Element/Al depth profiles show that in the Pozzallo transect heavy metal enrichments are more evident, especially in inshore sediments. The dynamic and chemico-physical features of the water mass, combined with the bottom morphology, are invoked to explain the higher sediment accumulation rate and increasingly high contents of some trace metals measured in sediments near the Pozzallo coast.