TRACE METALS IN THE DEEP SOUTHERN ADRIATIC SEA SEDIMENTS (MEDITERRANEAN SEA)

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Abstract
Anthropogenic trace-metal concentrations were studied in sediments of the South Adriatic basin. This study shows that in some Mediterranean sedimentation systems, the anthropogenic trace metal contamination is affecting not only the coastal areas and continental shelf, but is transferred to some extent also in the adjacent continental slope and deep basin. Complex morphology and sedimentary processes are responsible for the spatial differences in trace metal concentrations between different sub-areas of the South Adriatic. Historical trace metal profiles show trends that were increasing in the 20th century and decreasing in the last 30 years.

Keywords: Trace elements, South Adriatic Sea, Sediments

The SW Adriatic Sea shows an extreme seafloor complexity with a series of large scale geomorphic elements, including the Bari Canyon System (BCS) and Dauno seamount, which reflect long-term tectonic deformation [1], and a large variety of erosive and depositional bedforms, which suggest the constructive interaction between distinct bottom water masses [2], effective down to the deep South Adriatic Pit (SAP). Dense water cascading events of North Adriatic Dense Water through the open slope, offshore the Gargano Promontory (OGP), and the BCS were showed to enhance the particle transfer towards the deep basin [3,4]. Additional sediment inputs to the Southern Adriatic come from the Croatian and Albanian continental shelf (eastern margin, EM).
A trace metal mass balance of the western Adriatic Sea has established that the most part of riverine metal supply accumulates on river prodeltas and along the Po River dispersion system [5]. The small unbalance escaping the accumulation on the continental shelf has been attributed to particle transfer toward the deep South Adriatic or out the Otranto Strait. A previous study [6] detected the occurrence of organic contaminants in the South Adriatic related to the influence of cascading events. However, it is still completely unknown if also land-derived trace metals are transferred and to what extent they accumulate in the South Adriatic sea.
Short sediment cores were retrieved in SAP, BCS and OGP. Furthermore, undisturbed surficial sediments were collected in 28 sampling sites distributed in different sedimentary settings of the South Adriatic sea, including the eastern margin (EM) (Fig. 1).

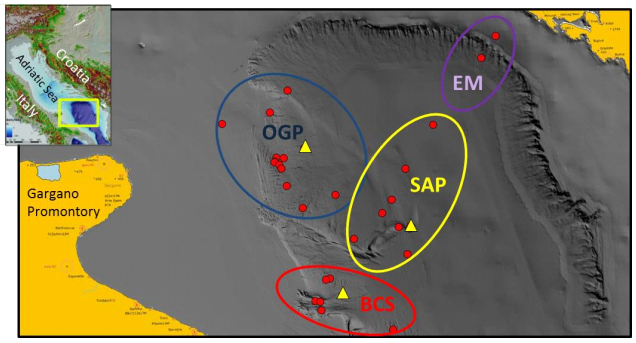

Fig. 1. Study area and location of the sediment cores (triangles) and surficial samples (circles)

The enrichment factors (EF) of trace metals in the surficial sediments showed moderate enrichment of Pb, Zn and Ni (EF ~2 to ~3) and minor enrichment for the other trace metals (EF ~2), suggesting that also the deepest part of the Adriatic basin is affected by (a slight) metal contamination. However, the four sub-areas documented different levels of contamination due to the combined effect of complex morphology, bottom currents and sedimentary processes. Samples collected in BCS and OGP, under the influence of dense shelf water cascading, showed on average higher Zn and Pb concentrations with peak levels recorded in the mud wave field north of the Gondola deformation belt, downstream of the Gondola slide [*sensu* 2]. Pb and Zn inputs from the eastern side of the Adriatic sea appear negligible. Sediment cores were dated by using ^{210}Pb profiles. The preindustrial concentrations of trace metals were detected in the deepest layers of sediment cores and were established as their background levels (BL). The Pb profile of the core collected on the sediment drift at the exit of the Bari canyon showed an increasing pattern from 1930s to 1990s, followed by slightly decreasing trend upwards. Zn showed an increase from 1930s to 1980s, reaching the highest concentration (84 mg kg^{-1}) in 2010, while Cr and Cu were close to the BL (65 mg kg^{-1}). In the other cores, metal profiles were less informative due to the lower sediment accumulation rates.

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