

Natural and anthropogenic heavy metals in the sediments of Saronikos Gulf, Greece: reviewing 15 years of observations

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Scope

The Saronikos Gulf in the Central Aegean Sea is a fairly complex coastal system, being the main receptor of domestic and industrial effluents of Athens metropolis (5,000,000 inh.), and recognized as a heavily impacted marine area [1]. We present an assessment of heavy metal contamination based on the analysis of 95 surface sediment samples obtained between 1999 and 2013, analyzed by XRF [2].

Discussion and conclusion

Heavy metal (Cr, Ni, Cu, Zn and Pb) and As contents compared against empirical sediment quality guidelines ERM-ERL and TEL-PEL exceeded all criteria pointing to high probability for severe impairment of the marine life. Subsequently, enrichment factors were estimated for selected elements, using Al as normalizer and a local deep sediment as background. Mean EFs for V, Cr, Mn, Co, Ni, Mo and As were found to be <2 and corroborate for natural occurrence for those elements. On the contrary, mean EFs for Cu, Zn and Pb were high and reached values of 45, 25 and 22, for Pb, Cu and Zn, respectively. Elefsis Bay and the area around the Waste Water Treatment Plant on Psyttalia island are the most impacted areas of the Gulf. A decreasing trend in spatial EF distribution was observed from the NE to SW, i.e. as the distance from the heavily urbanized sectors of Athens increases.

General linear model multivariate analysis was used to identify trends in heavy metal enrichment during the 14-year period of observations. Despite the enforcement of several measures aimed to the improvement of the marine environment, no significant decreasing (or increasing) heavy metal contamination trends could be identified.

[1] Paraskevopoulou *et al.* (2014) *Mar. Pollut. Bull.* **87**, 323–337. [2] Karageorgis *et al.* (2009) *Water Air Soil Pollut.* **204**, 243–258