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Potentially harmful elements (PHEs) distribution in the particulate, colloidal and dissolved fractions of estuarine waters (Gulf of Trieste, Northern Adriatic Sea)

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Partitioning of potentially harmful elements (PHEs) and their speciation in estuarine environments strongly depends on the physico-chemical boundary conditions, especially in terms of salinity gradient. Due to their high abundance in aquatic environments, the colloidal fraction is known to play a central role in controlling PHEs occurrence, mobility and speciation.

The present work aims at elucidating PHEs partitioning between particulate (> 0.45 μm), colloidal (10 kDa - 0.45 μm) and dissolved (< 10 kDa) fractions in different estuarine environments of the Gulf of Trieste (Northern Adriatic Sea). In order to achieve these objectives, water samples from surface and bottom layers of the water column were collected from the most important Italian and Slovenian river mouths of the Gulf. Several CTD (Hydrolab H_2O Multiprobe with a 0.10 dbar pressure step) vertical profiles of salinity, temperature and turbidity were recorded before sampling in order to identify the water masses. Generally, the surface water samples were collected at variable depth, according to the salinity trend and along the salinity gradient, whereas the bottom water samples were representative of the marine water intrusion. In addition, the main physico-chemical parameters (temperature, pH, redox potential (Eh), dissolved oxygen and electrical conductivity (EC)) were measured in situ through portable probes (pH-meter PH25 and Conductivity-meter CM35+ by Crison Instruments). Samples for PHEs detection were filtered through 0.45 μm filters (Millipore HA, Ø 47 mm) in order to isolate the particulate fraction which was acid-digested through a total dissolution in a closed microwave system (Multiwave PRO, Anton Paar). Subsequently, the filtrate samples were ultrafiltered through 10 kDa membranes (Vivaflow 200, Sartorius). The ultrafiltration was performed in recirculation mode using a concentration factor equal to about 60 in order to collect large amounts of colloids. All sample aliquots were analysed for PHEs determination by means of Inductively Coupled Plasma Mass Spectrometry (ICP-MS, Nexion 350x Perkin Elmer), with the only exception of Hg which was analysed through Cold Vapor Atomic Fluorescence Spectrometry (CV-AFS, Mercur Analytic Jena). Results will help in understanding the behavior of PHEs which are supplied to the estuarine environments in association with freshwater inputs affected by several anthropogenic sources.