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Fluxes and fate of particulate mercury in a contaminated coastal environment (Gulf of Trieste, northern Adriatic Sea)

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As the result of historical mining activity in Idrija (western Slovenia), mercury (Hg) contamination in the Gulf of Trieste (northern Adriatic Sea) still represents an environmental issue of great concern for the local authorities [1-3]. The element has been conveyed into the marine-coastal area by the Isonzo/ Soča River freshwater inputs for centuries, mainly in association with the suspended particulate matter (SPM) during periods of medium-high discharge often corresponding to river plume events [2,4,5].

The aim of this study was to investigate the occurrence of Hg bound to SPM (particulate Hg, PHg) in the coastal water twentyfive years after the mine closure and to assess sedimentary Hg fluxes in the northernmost sector of the Gulf, a shallow and sheltered embayment where the accumulation of fine sediments is promoted. Sediment traps were placed both at the surface and at bottom water layers at four different sites and settling particles accumulated into each trap were collected approximately every 15 days during 6 sampling campaigns.

In terms of grain size composition, the SPM consisted predominantly of silt (77.7 ± 10.1 %) and differences were observed among sites, water layers and sampling campaigns. Concentrations of PHg were consistent with previous studies focused on the sediment compartment [1,2] and ranged overall between 0.61 and 6.87 $\mu\text{g g}^{-1}$ showing slightly higher values at the bottom (1.50 ± 0.52 and 2.31 ± 1.58 $\mu\text{g g}^{-1}$ in surface and bottom water layers, respectively) most likely due to resuspension of fine particles enriched in Hg from bottom sediments.

The estimated daily Hg fluxes associated with settling particles showed a notable variability, up to an order of magnitude, both in the surface water layer ($3.07 - 94.6$ $\mu\text{g m}^{-2} \text{d}^{-1}$) and at the bottom ($11.3 - 245$ $\mu\text{g m}^{-2} \text{d}^{-1}$). Moreover, a significant correlation ($r = 0.762$) was observed between PHg and SPM daily fluxes thus confirming that, still nowadays, periods of high PHg concentrations in the water column as well as of Hg sedimentary fluxes at the sea bottom roughly corresponds to higher SPM inputs from the Isonzo River.

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