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Sed Net

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MONITORING SEDIMENT QUALITY AT RIVER BASIN SCALE
Understanding the behaviour and fate of pollutants

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Book of abstracts

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MERCURY CYCLING BETWEEN WATER COLUMN AND UPPER SEDIMENTS IN A CONTAMINATED AREA (LARGO DO LARANJO, AVEIRO, PORTUGAL)

The fate and reactivity of anthropogenic mercury in aquatic environment is of major concern owing to its toxicity to most organisms and man. In Ria de Aveiro, a chloralkali plant has been discharging mercury during decades into one of the remotest branches. Most of the discharged mercury settles down in Largo do Laranjo, an inner bay of 1.5 km². Since 80's, several works have identified high mercury concentrations in sediments, suspended particulate matter and water [1, 2, 3]. The highest concentrations of mercury (max. 35 $\mu\text{g g}^{-1}$) were found in sediments at 40 cm depth, corresponding to the period of maximum industrial production [2]. However, there is an escape of particulate mercury when surface sediments are resuspended and transported by the tide to the rest of the lagoon [4].

The present work aims to study the reactivity and cycling of mercury in Largo do Laranjo and attempts to estimate the contribution of pore waters to mercury distribution in the water column.

In dissolved phase of water column, the reactive mercury concentrations varied between 10 and 37 pmol dm⁻³, accounting only to 4-16% of the total dissolved mercury. Enhanced levels were found in low tide at sites located closer to the industrial affluent. Both reactive mercury or non-reactive mercury were correlated with the dissolved organic matter (r equal to 0.656 and 0.794, respectively), which indicates the importance of these compounds in the mercury distribution in the water column. In the particulate phase, total mercury concentrations were higher at low tide (19 to 95 nmol g⁻¹) than at high tide (8 to 23 nmol g⁻¹), and no significant relationship was observed between mercury and particulate organic matter. Higher concentrations of total mercury (> 70 nmol g⁻¹) were recorded in sediments deposited near the industrial discharge and lower values (minimum of 0.73 nmol g⁻¹) in sands near the bay outlet. The mercury distribution were positively correlated with the fine fraction of the sediments ($r=0.785$), organic carbon content ($r=0.837$) and iron extracted by hydroxylamine solution ($r=0.919$). Reactive mercury in pore waters of surface sediments (17-188 pmol dm⁻³) exceeded two to ten times the values in the water column (10-37 pmol dm⁻³), and account to 4-20% of the total dissolved mercury in pore waters. Again, reactive mercury concentrations are positively correlated ($r=0.690$) to dissolved organic carbon, indicating the importance of organic ligands. The application of the first Fick law of diffusion allows

estimating diffusive fluxes (J) across the water-sediment interface. The diffusive fluxes of reactive mercury varied between -0.01 to 0.67 nmol/(m².12h), the highest values being observed nearby the effluent discharge. The diffusive fluxes of non-reactive mercury were higher and ranged between 0.11 to 15.2 nmol/(m².12h).

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