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Trace elements in a stratified estuarine environment: behaviour along the water column and mobility at the sediment-water interface (Gulf of Trieste, northern Adriatic Sea)

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Sediments often act as reservoirs of contaminants, but they can also be considered a secondary source of contamination due to remobilisation processes at the sediment-water interface (SWI) which may affect the quality of the overlying water and aquatic biota [1,2]. The estuarine system of the Timavo/Reka River is located in the Gulf of Trieste (northern Adriatic Sea) and the innermost sector of the estuary was recognised as the most critical area. There, elevated concentrations of potentially toxic trace elements (PTEs) were detected in surface sediments and the scarce water circulation led to a permanent oxic-hypoxic interface along the water column [3].
This research aims at understanding if and how biogeochemical processes may affect PTE (As, Cr, Hg, Fe, Mn, Ni, Pb, V) mobility and related fluxes at the SWI. Sampling activities were performed before (June) and after (September) the forced aeration by means of a system of porous pipes laid on the bottom with the aim to re-oxygenate the water column in summer. Water aliquots were sampled along the water column, short sediment cores were collected to investigate the solid (sediments) and dissolved (porewater) phases and *in situ* benthic chamber experiments were conducted at the SWI.
Results showed that the water column was oxygen stratified and hypoxic conditions were observed in the bottom water layer, mostly in June (2.29 mg/L of dissolved oxygen) when reductive conditions also occurred (-58 mV). Consequently, dissolved PTE concentrations increased with increasing depth and were maximum at the bottom due to dissolution/desorption processes involving Fe and Mn oxy-hydroxides [4]. A gradual oxygen depletion was also observed inside the chamber during the benthic chamber experiments testifying to organic matter remineralisation processes and subsequent increase of dissolved PTEs.
Regarding PTE profiles in porewater, the highest PTE concentrations were observed in June, especially at the top of the sedimentary sequence implying that hypoxic conditions may promote the release of PTEs at the SWI.

[1] C. Caplat, H. Texier, D. Barillier, C. Lelievre, *Mar. Pollut. Bull.* **2005**, *50*, 504–511.
[2] E. Petranich, S. Croce, M. Crosera, E. Pavoni, J. Faganeli, G. Adami, S. Covelli, *Environ. Sci. Pollut. R.* **2018**, *25*, 26887–26902.
[3] E. Pavoni, M. Crosera, E. Petranich, J. Faganeli, K. Klun, P. Oliveri, S. Covelli, G. Adami, Estuar. Coast *in press* **2021**, DOI: 10.1007/s12237-021-00910-9.
[4] O. Dellwig, T. Leipe, C. März, M. Glockzin, F. Pollehne, B. Schnetger, E.V. Yakushev, M.E. Böttcher, H.J. Brumsack, *Geochim. Cosmochim. Ac.* **2010**, *74*, 7100–7115.