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Effects of hypoxia on biogeochemical cycling of nutrients and trace elements in a stratified estuarine system (Gulf of Trieste, northern Adriatic Sea)

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Estuaries can be thought as a sedimentary trap leading to the accumulation of potentially toxic trace elements (PTEs) in sediments. However, biogeochemical processes at the sediment-water interface (SWI) may also be responsible for the release of dissolved PTEs and nutrients in the overlying water column affecting the water quality [Petranich et al., 2018; Garcia-Ordiales et al., 2020]. The estuarine system of the Timavo River (Gulf of Trieste, northern Adriatic Sea) is a semi-closed aquatic environment where a long-lasting oxic-hypoxic interface along the water column occurred due to the scarce water circulation in the innermost sector [Pavoni et al., 2021]. To prevent bloom-forming and potential production of toxins and off-flavours, artificial mixing has been provided with a bubble plume installation connected to pressurised air and built on the sediment surface aiming at re-oxygenating the water column. The aim of this research was to evaluate the behaviour of PTEs (As, Cr, Hg, Fe, Mn, Ni, Pb, V) and nutrients (NO_3, NO_2, NH_4 and SRP) along the water column and at the SWI before (June) and during (September) the activation of the forced aeration system. Water samples were collected at different depths along the water column, *in situ* benthic chamber experiments were performed at the SWI and short sediment cores were sampled to investigate both the sediment and porewater. Dissolved oxygen decreased along the water column, especially in June when hypoxia (2.29 mg/L) and reductive conditions (-58 mV) were observed at the bottom resulting in increasing dissolved PTE and nutrient concentrations. Accordingly, a gradual oxygen depletion was observed in the benthic chamber testifying to intense organic matter remineralisation processes. Moreover, the highest concentrations of dissolved PTEs in porewater were restricted to the top of the sedimentary sequence, especially in June when hypoxic conditions may promote PTE and nutrient effluxes from the sediment to the water column.

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