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APPLICATION OF A CHEMOMETRIC APPROACH TO A PRELIMINARY GEOCHEMICAL CHARACTERISATION OF THE TIMAVO/REKA RIVER MOUTH

E. Pavoni^{1,2}, M. Crosera¹, E. Petranich², S. Covelli², J. Faganeli³, A. Acquavita⁴, P. Oliveri⁵, G. Adami¹

¹*Dipartimento di Scienze Chimiche e Farmaceutiche, Università degli Studi di Trieste, Trieste, Italy*

²*Dipartimento di Matematica e Geoscienze, Università degli Studi di Trieste, Trieste, Italy*

³*NIB-MBS – National Institute of Biology, Marine Biology Station, Piran, Slovenia*

⁴*ARPA FVG – Agenzia Regionale per la Protezione Ambientale del Friuli Venezia Giulia, Palmanova, Italy*

⁵*Dipartimento di Farmacia, Università degli Studi di Genova, Genova, Italy*

Accumulation of contaminants and their potential mobility represent two of the main environmental issues facing marine coastal environments. Sediments often act as “reservoirs” of contaminants including potentially toxic trace elements but they can also be considered a secondary source due to remobilisation processes at the water-sediment interface, which can affect the water quality [1].

The Timavo River, whose source is in Croatia, flows on flysch terrains in Slovenia (where it is called the Reka) before sinking into the Karst Plateau at the Škocjan Caves. After an underground path of approximately 38 km the river re-emerges from several springs 2 km from the sea in the northwest sector of the Gulf of Trieste, the site of an industrial area.

This work aims to provide a preliminary geochemical characterisation of the Timavo river mouth, focusing on the occurrence and distribution of trace elements (Al, As, Ba, Cd, Co, Cu, Cs, Cr, Fe, Hg, Mn, Ni, Pb, V and Zn) in different environmental matrices. For this purpose, water (surface and bottom) and sediment samples were collected from five sites in the estuarine system of the Timavo River. In addition, continuous salinity, temperature and turbidity vertical profiles were recorded in order to identify the water masses and the main physico-chemical parameters were measured *in situ*. Size fractionation was performed using vacuum filtration to isolate the suspended particles from the dissolved fraction.

The hydrodynamic conditions showed a sharp halocline even in the innermost sector of the study area, attesting to the evident and permanent salt-wedge intrusion. Due to cooling waters from a thermal power plant, particularly warm waters were found in the mixing and bottom layers of the water column and the reductive conditions measured at the bottom in the innermost sector of the study testify to potential anoxia at the sediment-water interface. Principal Component Analysis (PCA) was employed on chemical and grain-size analyses in order to reveal disparities among the different sectors of the estuarine system. The surface sediments were found to be enriched in trace elements whose concentrations often exceed the Italian regulatory threshold limits, in particular in the innermost sector. Furthermore, the PCA results also demonstrate that several trace elements are strongly linked to the silty-clay

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fraction which prevails in the innermost sector of the study area. The only exception is represented by Cr and Ni since the Timavo River contribution can be clearly identified as the primary source due to alteration processes of Cr-spinel enclosed in the bauxite veins found along its underground river path [2]. The reductive conditions found in the innermost sector appear to be responsible for dissolution processes, increasing dissolved trace elements in the water column. Conversely, oxidative conditions prevail in the external sampling sites. Here, oxidation and precipitation processes lead to trace elements partitioning in the suspended particles.

References

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