

Distribution of elements in stream and alluvial sediments in the Savinja and Voglajna Rivers in the area of abandoned Zn-smelting operation

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The aim of this contribution is to make international geochemists aware of the recent studies dealing with the composition sediments of two rivers in Central Europe, which are affected by natural and anthropogenic factors. Savinja and Voglajna rivers were studied to determine the natural and anthropogenic geochemical associations and to identify possible sources of detected associations [1,2]. Potential anthropogenic sources in the area are urbanization, traffic, historical Zn smelting and improperly constructed pyrometallurgical waste deposit. Samples of stream and alluvial sediments in profiles were collected. Two fractions were analyzed by ICP-MS. Selected samples were additionally inspected by XRD for determination of mineral composition. Differences in Al/Ti oxide ratios are related to the source's rocks variations in the catchment area, whereas K/Al oxide ratios pointed out erosion/deposition regimes. Factor analysis showed the following elemental associations. The first natural association (Li, Sc, Al, V, Cs, and Ga) is related to sediments containing kaolinite, the second (Mg, Ca, and Te) to dolomite-rich sediments, the third (Hf and Zr) to the quartz and calcite rich sediments, containing increased amount of heavy mineral fraction. The anthropogenic association (Ag, In, Sb, Cu, As, Zn, Pb, Cd, Bi, Mo, and Sn) is related to historical Zn smelting in Celje region and remobilization of pollutants from improperly constructed pyrometallurgical waste deposit. The highest levels of Zn, Cd, and Pb were found in the alluvial sediments near the abandoned slag and ore roasting residues (Fig.1). These anomalies can be detected even more than 30 km downstream. Although the Zn smelter in Celje has not been in operation for half a century, the effects of inadequate waste management are still present, which emphasizes the importance of proper management of abandoned and active mining and ore processing waste to protect the environment.

[1] Žibret, Elemental Associations in Stream and Alluvial Sediments of the Savinja and Voglajna Rivers (Slovenia, EU) as a Result of Natural Processes and Anthropogenic Activities (2022), Minerals 12, 1–18.

[2] Žibret & Čeplak, Distribution of Pb, Zn and Cd in stream and alluvial sediments in the area with past Zn smelting operations (2021), Scientific Reports 11, 1-14.

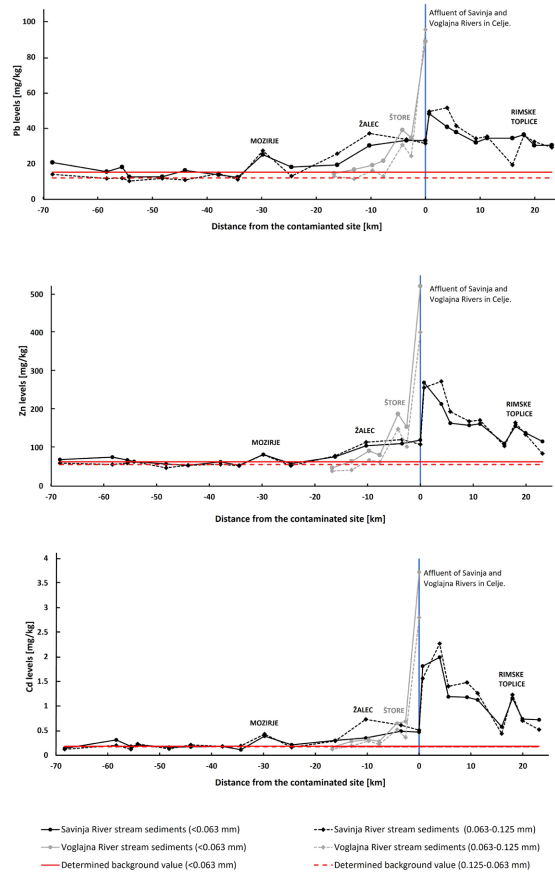


Figure 1. Content of Pb, Zn and Cd in stream sediments in accordance to the distance from the Savinja and Voglajna affluent (Figure taken from [2]).