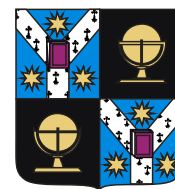




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Geochemistry and mineralogy of stream sediments from the Bistricioara basin – the sector between Capu Corbului and Grintieș

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Abstract

Trace elements distribution, including rare earth elements (REEs), in stream sediments of the study area, were of high concern of interest in the present thesis.

A total number of 83 riverbed sediments samples collected from the Bistricioara River and local tributaries (Primatar, Bradul, Prisacani, Barasau, Grintiesul Mare and Valea Seaca) were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) and energy dispersive X-ray fluorescence spectrometry (XRF).

All REEs were identified and quantified in the present work using the ICP-MS technique. For the other 24 elements (Ti, V, Cr, Co, Zn, Li, Be, Rb, Sr, Y, Sc, Zr, Nb, Sb, Ba, Ta, W, Pb, U, Ni, Cu, Mo, As, Th) similar information was obtained either by ICP-MS or XRF techniques.

The impact and the relevance of the obtained database might be significant at a local scale of about 50 km². Enrichments of some trace elements of interest in comparison to the upper continental crust allowed discrimination between various mineralization processes specific to the investigated areas.

Uranium mineralization and Paltin-type (Pb, Zn) mineralization seems to be specific for the NW area of the investigated region.

A negative anomaly characteristic for the upper crustal rocks was identified for Eu and Ce elements.

Evidence was obtained also for the existence of ultramafic rocks (Ni, Cr, Co and V) in the investigated riverbed sediments.

From the investigated tributaries to the Bistricioara River, Barasau seems to exert the highest influence on the abundance of REEs in the entire area.

The existence of magnetite, garnets, pyrite and sillimanite minerals was confirmed by SEM-EDAX and XRF analysis, and optical microscopy. For the analysed REEs this is the first study reporting consistent information on the concentrations of the entire array of REEs in Bistricioara Basin stream sediments.

Relevant scientific data related to geochemical characteristics of ultramafic rocks existent in the investigated area were also generated.

The concentration and spatial distribution of three naturally occurring radionuclides, ^{238}U , ^{232}Th and ^{40}K , have been determined in stream sediments from six left-side tributaries of Bistricioara river (Bistriței Mountains, Eastern Carpathians, Romania).

Historically, several mining works were undertaken in the area, to explore its' potential regarding mineral resources. As well, this study aims to serve as a reference point for future environmental monitoring, in the event of resuming the mining activities in this area, which accommodates a major uranium deposit.

Stream sediment samples were collected from the riverbed and the concentration of naturally occurring radionuclides was determined using gamma-ray spectrometry with high purity germanium (HPGe) detector. The average activity concentration of ^{238}U , ^{232}Th and ^{40}K was found to be 27.84, 41.08 and 511.27 Bq·kg⁻¹.

Based on radionuclides' activity concentrations, radiological hazard parameters were estimated to assess any radiation risk which may be associated with the riverbed sediments. The radiological hazard parameters, such as radium equivalent activity (Raeq.), absorbed gamma dose rates in the air (DR), annual gonadal dose equivalent (AGDE), representative level index (RLI), annual effective dose equivalent (AEDE), external hazard index (Hex) and internal hazard index (Hin), were all calculated and later compared with international safety limits. Generally, all radiological hazard parameters have values lower than the world average except AGDE and RLI values that exceed the UNSCEAR thresholds.