



Using mineralogical and geochemical data as a tool for determining potential environmental changes

Tamara Perunović (1), Branimir Jovančićević (1), Ilija Brčeski (1), Aleksandra Šajnović (2), Ksenija Stojanović (1), Vlada Simić (3), and Milica Kašanin-Grubin (2)

(1) Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, 11 000 Belgrade, Serbia, (2) Institute of Chemistry, Technology and Metallurgy IChTM, Centre of Chemistry, University of Belgrade, Njegoseva 12, 11000 Belgrade, Serbia, (3) Faculty of Mining and Geology, University of Belgrade, Djušina 7, 11 000 Belgrade, Serbia

Neogene lacustrine basins are often bearing coal, oil-shale and non-metallic minerals such as magnesite, borates and marls. Exploration of these deposits could put a lot of pressure on the landscape. Aim of this research is to show that geochemical and mineralogical data could be used as a tool in determining landscape sensitivity to an imposed change. To test this hypothesis Lower Miocene lacustrine Kremna basin, Serbia, was investigated. Kremna basin covers an area of approximately 15 km² and is located in SW Serbia. For the purpose of this study, geomorphologic and microclimatic characteristics of the area were assessed and geochemical and mineralogical composition of 43 sediment samples from one borehole was determined. The purpose of the drilling was to determine the possible evaporite deposit and boron occurrence. The borehole was 343 m deep and ended in weathered serpentinite. Landscape of Kremna basin is hilly-mountainous with pastures, meadows and agriculture as dominant vegetation type. The area is sparsely populated with mountain villages dispersed and mostly isolated. Main water supplies for villages are springs.

Climate data (1961-2012) indicate that the average precipitation is 988 mm, and temperature 7,5°C. However, variations in climatic conditions are evident since 1990 showing more profound change between colder and wetter, and warmer and drier years alternating every two to three years.

The base and the edge of the Kremna basin consist predominantly of ultrabasic rocks, serpentinite and ophiolitic mélange, which are all prone to weathering. Drill-hole date showed that uppermost clay and Mg rich sediments were overlain by a thin soil layer (~ 15cm). Leaching tests performed on these uppermost sediments indicated that they are dispersive and prone to erosion. Higher average concentration of boron and certain heavy metals, as well as presents of Cr, Hg, As, Pb, Ni, Th, U was determined. Effect of these elements on the environment can be highly negative especially to soil and water quality. Furthermore, eco-toxicological characteristics of rare elements (Eu, Lu, etc.) are still not entirely understood therefore their presence, by definition, should be considered as negative. Presence of these elements was determined in Kremna basin sediments.

According to the geomorphological and climatic characteristics of the area and detail study of the geochemical and mineralogical characteristics of the sediments from a drill-hole, it can be concluded that Kremna basin is a sensitive area to possible environmental changes. Furthermore, this study shows that sediment geochemical and mineralogical characteristics could be used as a tool to assess landscape vulnerability.