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Natural radioactivity and rock-water interactions in the springs of Sopron Mountains (Hungary)

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As groundwater is an important source of drinking water, its quality is of great importance. In recent years, following the EU regulations, radioactivity parameters are also included among the quality measures.

In the area of the city Sopron (Hungary), groundwater resources are used for drinking water supply. The area had been actively researched for fissile materials, and previous studies measured high radon activity for example in the geophysical observatory (500–1000 kBq m^{-3}) and in natural springs (up to 220 Bq L^{-1}).

Natural springs bear important information about their parent flow systems, about the transit time and the rock-water interactions along the flow paths. The aim of the study was to investigate the natural springs of the Sopron Mountains and to measure not only the physico-chemical properties (discharge rate, pH, electrical conductivity, temperature, dissolved oxygen content, redox potential, major ion content), but also to determine the uranium, radium and radon activity concentration of the springwaters.

The measurements revealed low discharge rate (< 5 L min^{-1}), low dissolved solid content (< 450 mg L^{-1} TDS) and temperature (10–12°C) for the majority of the springs, which indicate that the waters travel in the subsurface along local flow systems. Two springs, which are situated in the foothills, i.e. at lower elevation, show higher dissolved solid content (1115 mg L^{-1}, 481 mg L^{-1}) and higher temperature (15.6°C, 16°C). Their uranium content was also higher, 86–93 mBq L^{-1}. In the case of these springs, the physico-chemical parameters suggest longer travel time, i.e. more time for rock-water interactions which is reflected in their higher dissolved solid and uranium content.

Radon exceeding the 100 Bq L^{-1} activity concentration was measured in two springs. For the other springs, the radon concentrations were 2-79 Bq L^{-1}.

As all the springs are situated in the regional recharge area of groundwater resources of the area, the study delivered important information regarding the rock-water interactions and the

improvement of groundwater quality during subsurface reactions.