ENVIRONMENTAL RADIOISOTOPES: NATURAL TRACERS IN HYDROGEOLOGICAL STUDIES AND DRINKING WATER QUALITY PARAMETERS

A. Erőss[1,*], P. Baják[1,2], K. Hegedűs-Csondor[1], Á. Horváth[3], B. Izsák[4,5], M. Vargha[4]

[1]ELTE Eötvös Loránd University, Institute of Geography and Earth Sciences, Department of Geology, József and Erzsébet Tóth Endowed Hydrogeology Chair, Pázmány Péter sétány 1/c, 1117 Budapest, Hungary

[2]Università degli Studi di Milano, Department of Earth Sciences "Ardito Desio" (DiSTAD), 20133 Milan, Italy

[3]Eötvös Loránd University, Institute of Physics and Astronomy, Department of Atomic Physics, Pázmány Péter sétány 1/a, 1117 Budapest, Hungary

[4]Public Health Directorate, National Public Health Institute, Budapest, Hungary

[5]Faculty of Health Sciences, Department of Public Health Sciences, Semmelweis University, Hungary

*Corresponding email address: eross.anita@ttk.elte.hu

In groundwater mostly uranium, radium and radon can be found. Depending on the measured activity concentrations, radiation exposure through the consumption of groundwater-derived drinking water can have a significant impact on human health. To find the most appropriate risk management methods, understanding groundwater flow systems is a key issue, as it helps to explain the origin of radioisotopes. Thanks to the mandatory measurements of gross alpha, gross beta and radon activity of drinking waters in Hungary, a basic knowledge on radioactivity of groundwater is available. These measurements highlight where combined radionuclide-specific measurements and hydrogeological studies are essential further steps for safe drinking water supply. These radioisotopes, however, can be used as natural tracers in hydrogeological studies, due to their different physical and chemical behaviour in the subsurface environment. Elevated uranium values are either associated with recharge areas of groundwater flow systems or can be found in local flow systems, where oxidising conditions prevail. In the surroundings of the Velence Hills dissolved uranium in groundwater is mobilized and transported by local flow systems. Beside groundwater resources, relatively high uranium concentrations were measured in Lake Velence proving that the lake is integral parts of groundwater flow systems and receive uranium-containing groundwater. Radium is mobile under reducing conditions; therefore, it can be often found in thermal waters, which are associated with regional flow systems. In their discharge areas iron- and manganese oxyhydroxides may develop due to the change in redox conditions, which efficiently adsorb radium and hence act as a source of radon.