EGU24-888, updated on 19 May 2024
https://doi.org/10.5194/egusphere-egu24-888
EGU General Assembly 2024

Identifying Mixing Components by Natural Tracers in the Lake Hévíz System

Saeed Bidar Kahnamuei[1], Katalin Hegedűs-Csondor[1], Petra Baják[1], Ákos Horváth[2], Dénes Szieberth[3], György Czuppon[4], Márta Vargha[5], Bálint Izsák[5], and Anita Erőss[1]

[1]ELTE Eötvös Loránd University, Institute of Geography and Earth Sciences Department of Geology, József and Erzsébet Tóth Endowed Hydrogeology Chair, Budapest, Hungary (eross.anita@ttk.elte.hu)
[2]ELTE Eötvös Loránd University, Institute of Atomic Physics and Astronomy, Department of Atomic Physics, Budapest, Hungary (akos.horvath@ttk.elte.hu)
[3]Budapest University of Technology and Economics, Department of Inorganic and Analytical Chemistry, Budapest, Hungary (szieberth.denes@vbk.bme.hu)
[4]HUN-REN Research Center for Astronomy and Earth Sciences, Institute for Geological and Geochemical Research, Budapest Hungary (czuppon.gyorgy@csfk.org)
[5]National Center for Public Health and Pharmacy, Department of Public Health Laboratories and Methodology, Budapest, Hungary (vargha.marta@nngyk.gov.hu), (izsak.balint@nngyk.gov.hu)

One of the largest natural thermal lakes in the world, Lake Hévíz is located in the southwestern part of the Transdanubian Range's karst system (Hungary). It is fed by springs with different temperatures, which are located in a cave beneath the lake. The mixing of cold and hot waters generates the lake's sulphuric therapeutic water, and it is responsible for the cave formation at the bottom, resulting in the lake's unique ecosystem. The presented research aimed at the comprehensive geochemical characterization of waters in the wider surroundings of the lake (lake water, springs, observation, drinking water, and thermal water wells). Investigating the geochemical characteristics of water took on a novel perspective through the innovative application of radionuclides as natural tracers. Within the framework of this investigation, we utilized uranium, radium, and radon isotopes to identify the mixing of fluids and infer the mixing end members in the Hévíz karst system. Alpha spectrometry was applied on selectively adsorbing Nucfilm discs as an inventive approach to measure uranium and radium isotopes. Moreover, stable isotopic ratios of hydrogen and oxygen ($\delta^{2}H$ and $\delta^{18}O$) were determined to supplement the information on waters with different origins. Hydrochemical water analysis for measuring the concentration of major ions and trace elements was carried out using ICP-MS, ion chromatography, and UV-Vis spectrophotometry. The inferred fluid end members and their compositions are anticipated to provide insightful information on the hydrogeological functioning of the Lake Hévíz karst system, which is indispensable in sustainable water resource management and understanding climate change's impact.

Keywords: Thermal lake; Hydrogeochemical characteristics; Mixing fluids; Radionuclides; Stable isotopes; ICP-MS, Nucfilm, Alpha spectroscopy