

## **Hydraulic assessment of the Buda Thermal Karst area and its vulnerability (Budapest, Hungary)**

Brigitta Czauner (1), Anita Erőss (1), Ildikó Erhardt (2), Viktória Ötvös (3), Szilvia Simon (1), and Judit Mádl-Szőnyi (1)

(1) Eötvös Loránd University, Institute of Geography and Earth Sciences, József and Erzsébet Tóth Endowed Hydrogeology Chair, Department of Physical and Applied Geology, Hungary (brigicza@gmail.com), (2) Government Office for Vas County Department of Environmental Protection and Nature Conservation Management, Szombathely, Hungary, (3) Sopron Waterworks Co., Sopron, Hungary

Thermal and medicinal water resources of Budapest (Hungary), the “City of Spas”, are provided by the Buda Thermal Karst area. Assessment of its vulnerability requires the understanding of the discharge phenomena and thus the groundwater flow conditions in the area. Accordingly, BTK has already been the objective of several hydrogeological investigations, including numerical simulations as well, which led to conceptual models. The aim of the present study was the hydraulic evaluation of the flow systems based on the complex analysis of real, i.e. measured, archival hydraulic data of wells in order to i) get acquainted with the real flow systems, and ii) hydraulically confirm or disprove the previous conceptual models, in particular the applicability of gravity-driven regional groundwater flow concept and hydraulic continuity, separation of the natural discharge zones, and hypogenic karstification. Considering the data distribution, pressure vs. elevation profiles, tomographic fluid-potential maps, and hydraulic cross-sections were constructed for the first time in this area. As a result, gravitational flow systems and the modifying effects of aquitard units and faults were identified. Consequently, the differences in temperature, hydrochemistry, discharge distribution (one and two-components), and related cave forming processes between the Central (Rózsadomb) and Southern (Gellért Hill) natural discharge areas could be explained, as well as the hydraulic behaviour of the Northeastern Margin-fault of the Buda Hills could be determined. Regarding the on-going hypogenic karstification processes, regional upward flow conditions were confirmed along the main discharge zone of the Danube. Identification of gravity as the main fluid flow driving force, as well as the hydraulic effects of heterogeneities can significantly contribute to the recognition of the risk factors regarding the vulnerability of the Buda Thermal Karst area.

The research was supported by the Hungarian OTKA Research Fund NK 101356.