



Hypogenic karst development in a regional discharge area: Buda Thermal Karst, Hungary

A. Erőss (1), J. Mádl-Szőnyi (1), and A.É. Csoma (2)

(1) Department of Physical and Applied Geology, Institute of Geography and Earth Sciences, Eötvös Loránd University, Budapest, Hungary, (2) ConocoPhillips, Subsurface Technology, Basin and Sedimentary Systems, Houston, TX, USA

Europe's largest naturally flowing thermal water system can be found in Budapest. The springs and wells that supply the famous baths of Budapest discharge from a regional Triassic carbonate rock aquifer system. As the result of the interaction of discharging waters and carbonate rocks, extensive cave systems has developed and still developing today. These caves belong to the group of hypogenic caves, and their special morphology and peculiar minerals make Budapest, beside the city of spas, also "the capital of caves".

According to the recent developments in the speleogenetic theories, hypogenic karsts and caves are viewed in flow system context, and can thus be considered as the manifestations of flowing groundwater.

Being a marginal area at the boundary of uplifted carbonates and a sedimentary basin, the Buda Thermal Karst serves as a discharge zone of the regional fluid flow. This implies that it may receive fluid components (karstic and basinal) from several sources resulting in a wide range of discharge features including springs, caves, and mineral precipitates.

In this study the discharge areas of the Buda Thermal Karst were investigated to determine how the discharging fluids and adjoining phenomena (e.g. caves, mineral precipitates) can be telltales of their parent fluid systems, the processes acting along the flow path and operating directly at the vicinity of the discharge zone. A comprehensive hydrogeological study was carried out for the investigation of these phenomena and for the characterization of processes acting today at the discharge zone of the Buda Thermal Karst. Methods included hydrogeochemical, mineralogical and microbiological investigations.

Among the results of the study, several processes were identified which can be responsible for cave development and formation of minerals, among them mixing corrosion and microbially mediated sulphuric acid speleogenesis have crucial role. Furthermore, the role of the adjacent sedimentary basin was reevaluated. Based on the results of this study, the Buda Thermal Karst area was divided into two subsystems for which new conceptual flow and process models were developed.

These results bring a new insight into the processes acting in the regional discharge zone of a karst aquifer system, which could be also responsible for hypogenic cave development. The Buda Thermal Karst system can be considered as the type area and in same time the modern analogue for hypogenic karsts.

The research was supported by the Shell E&P and the Hungarian Scientific Research Fund (OTKA-101356).