Book review

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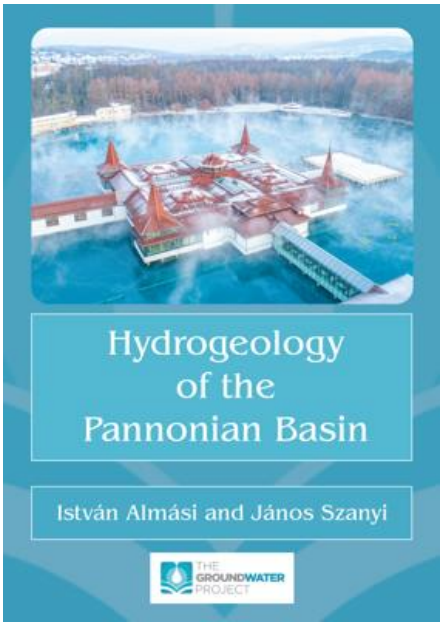
István ALMÁSI and János SZANYI (2021): Hydrogeology of the Pannonian Basin,
Publisher: The Groundwater Project, Guelph, Ontario, Canada, 2024,
Printed version: 73 pages https://doi.org/10.21083/978-1-77470-044-0

The book *Hydrogeology of the Pannonian Basin* is part of the "Important Aquifer Systems of the World" series created by *The Groundwater Project*, as the Pannonian Basin is one of the world's most complex sedimentary aquifer systems, shared by nine countries.

The Groundwater Project is a nonprofit organization established in 2017 under the leadership of Dr. John Cherry, with the mission of solving problems related to groundwater and improving the accessibility of groundwater knowledge. To achieve this goal, it produces and provides high-quality educational materials on groundwater free of charge in several languages, all available for download on its website (www.gw-project.org), including this book.



Authors István ALMÁSI and János SZANYI aim to present the development of groundwater knowledge in the Pannonian Basin from a historical perspective and to convey the concept that moving groundwater should be considered a geological factor, as it can mobilize, transport, and deposit both heat and materials. The book primarily focuses on Hungary, which covers nearly three-quarters of the Pannonian Basin, while also offering insight into the hydrogeology of neighbouring countries, since the basin contains many of Europe's transboundary aquifers.

The book is divided in eight substantive chapters, complemented by exercises and their solutions to deepen understanding of the content.

The first four chapters introduce the hydrogeological environment — geology, topography, and climate — which shaped the complex hydrogeological features, including geothermal conditions, and how these have developed, persisted, and been utilized over the past two millennia. A clear and illustrative figure presents the chronology of key events. It is emphasized that, in addition to its abundant drinking water resources, the Pannonian Basin is particularly renowned for its geothermal wells, thermal spas, and the modern use of geothermal energy. The book describes two superimposed flow systems in the central part of the basin: a gravity-driven shallow system and an over pressured deep system. The existence of these systems is supported by results of isotopic and water chemistry studies from previous publications, presented in an accessible manner. The figures are well-developed and aesthetically pleasing, significantly facilitating understanding. Furthermore, the authors conducted an extensive literature review.

At the end of Chapter 4, the authors thoroughly present Dr. József Tóth's theory of gravity-driven flow systems. Tóth emigrated from Hungary to Canada in 1960, where he pioneered the development of modern thinking about gravity-driven groundwater flow. His influence on the authors is significant, as they both attended his hydrogeology course 30 years ago, which marked the beginning of a close friendship and professional collaboration.

In the second half of the book, the authors discuss the types and temporal changes of water usage, the various forms of geothermal energy utilization, and its impacts on groundwater. In the chapter on oil hydrogeology, they thoroughly explain the similarities and differences between hydrocarbon and groundwater flow, highlighting that they often occur in the same reservoir — information that is especially important for medium- and high-enthalpy geothermal energy use. The overpressure systems were also discovered during petroleum exploration in the last century.

Overall, this book is a highly valuable resource for university education and even for curious high school students. It provides a clear and comprehensive summary of nearly two centuries of hydrogeological knowledge of the Pannonian Basin. A Hungarian translation is also expected to be published, which will undoubtedly attract an even wider audience.

Together with the authors, I encourage readers to make beneficial use of this book and discover further fascinating details about the basin and the geothermal processes occurring at the boundary zones of its surrounding limestone mountains. The book is available for download at the following link: https://gw-project.org/books/hydrogeology-of-the-pannonian-basin/

Happy reading!
László LÉNÁRD