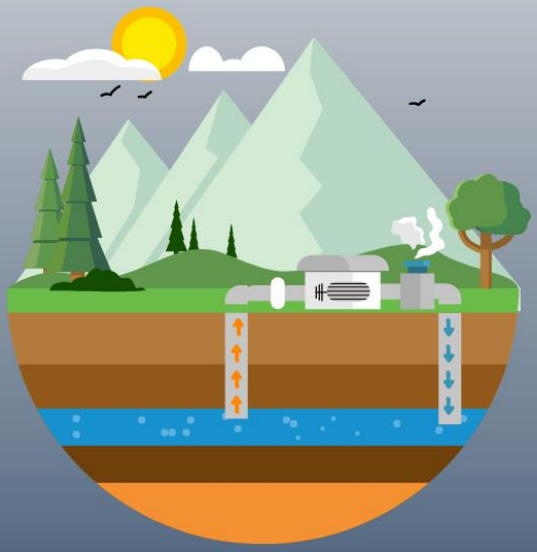
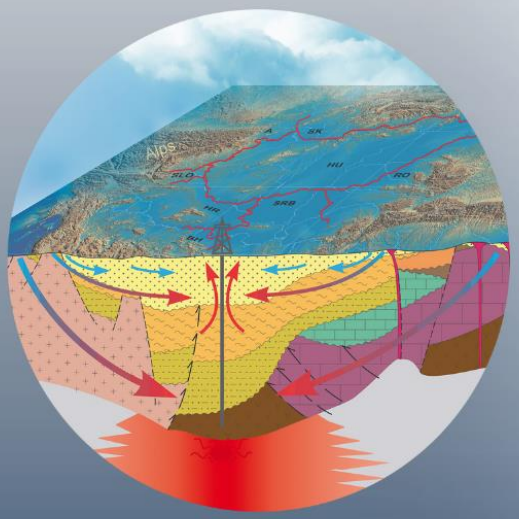
Schedule and lecturers

GEOTHERMAL SHORT COURSE 2025

Exploration and utilisation of geothermal resources in sedimentary basins

Budapest, Hungary
23-27 JUNE 2025





SARA

Supervisory Authority
for Regulatory Affairs

Time	Mon 06/23	Time	Tue 06/24	Time	Wed 06/25	Time	Thu 06/26	Time	Fri 06/27
		9:00–9:20	Geophysical methods in geothermal exploration -introduction & overview (Tamás Lukács - SARA)	9:00–9:20	Resource assessment and classification methods (Annamária Nádor - SARA)	9:00–9:20	Travel to the location	9:00–9:30	Case study - Paris Basin (Miklós Antics, EGEC)
		9:20–9:50	Gravity, magnetics, and magnetotelluric methods (Renáta Szebenyi - SARA)	9:20–10:20	Geological risk assessment in hydrothermal exploration (Imre Szilágyi - MVM)	9:20–10:00	Visit of well-logging process in a karstic well	9:30–10:00	Case study - Molasse Basin (Gregor Goetzl, EVN Austria)
10:00-10:45	Arrival, registration	9:50–10:20	Geophysical well logging (György Bernáth - SARA)	10:20–10:40	Economic considerations: techno-economic performance assessment of geothermal reservoirs (Jan Diedrik van Wees - Utrecht University)	10:00–10:40	Travel to the location	10:00–10:30	Participants presentation I
		10:20–10:40	Coffee break					10:30–10:50	Coffee break
		10:40–11:10	Geophysical exploration methods - 2D & 3D seismics (Ernő Takács - SARA)	10:40–11:00	Coffee break	10:40–12:00	Visit of drill site	10:50–11:30	Participants presentation II
11:00–11:20	Welcome addresses, aim of the course	11:10-11:30	Case studies - Seismic exploration (Ernő Takács - SARA)	11:00–12:00	Drilling process in geothermal (István Vass - MOL Group)				
11:20–12:00	Round-table introduction of the participants	11:30-12:00	Case studies - Thermal and mechanical modelling in the Pannonian Basin (Eszter Békési - HUN-REN EPSS)					11:30–12:00	Moderated discussion
12:00–12:30	Introduction: the role of geothermal energy in the green transition, geothermal state-of-the-art and future trends (Sanjeev Kumar - EGEC)	12:00–13:00	LUNCH BREAK	12:00–13:00	LUNCH BREAK	12:00–12:30	LUNCH BREAK	12:00–13:00	LUNCH BREAK & Discussion
12:30–13:20	LUNCH BREAK					12:30–13:00	Travel to the location		
13:20–13:50	The geological context of conceptual play, reservoir characterisation models (Annamária Nádor / Ábel Markó - SARA)	13:00–13:30	General framework background of hydrogeological investigations (Teodóra Szőcs - SARA)	13:00–13:40	Geothermal well-tests (Attila Galsa - ELTE)	13:00–14:00	Visit of a geothermal heating system in Budapest	13:00–13:30	Closing ceremony & certificates
		13:30-13:50	Hydrogeochemistry and isotope geochemistry in thermal waters (Teodóra Szőcs - SARA)						
13:40–14:20	Heat transport in geothermal systems (László Lenkey - ELTE)	13:50-14:10	Monitoring of thermal water use, data reporting (Ágnes Rotár-Szalkai - SARA)	13:40–14:10	Integrated management of thermal water resources and interaction of geothermal energy utilisation with groundwaters (Teodóra Szőcs - SARA)				
14:20–14:40	Introduction: Process of geothermal project development (Gábor Molnár - ArticGreen)	14:10-14:30	Data management (Nóra Gál - SARA)	14:10-14:30	Challanges of reinjection into porous aquifers (Ábel Markó - SARA)	14:00–14:30	Travel to the location		
14:40–15:00	Coffee break	14:30-14:50	Coffee break	14:30-14:50	Coffee break	14:30–16:30	Visit to Széchenyi Thermal Spa & Zoo geothermal heating, Buda Thermal Karst (Teodóra Szőcs, Anita Erőss)		
15:00–15:30	3D geological models as a framework (Gyula Maros, Márton Palotai - SARA)	14:50-15:20	Introduction to hydrogeological modelling (Márk Szijártó - ELTE)	14:50-15:10	Hydrogeochemical aspects of reinjection (Andrea Szűcs - SARA)				
15:30-15:50	Case study in basin scale - GeoConnect 3D project	15:20-15:50	Case studies - Flow systems in the Pannonian Basin and their geothermal consequences (Brigitta Czauner - ELTE)						
15:50-16:10	Case study in regional scale - Transenergy project	15:50-16:20	Case studies - Hydrogeological model of the Budapest Thermal Karst (Éva Kun - SARA)						
16:10–16:30	Case study in sub-regional scale - Budapest project								
16:30-18:00									
18:00-21:00	**Facultative social event**		**Facultative social event**		**Facultative social event**				

Introduction of the lecturers:

Miklos Antics is Managing Director and associate partner of both GPC Instrumentation Process (GPC IP) and GEOFLUID France. He is being active during the past 35 years in project development from low to high enthalpy fields in France, Belgium, Switzerland, Netherlands, England, Italy, Romania, Hungary, Slovakia, Slovenia, Djibouti, Ethiopia, Kenya (East African Rift countries), El Salvador, Armenia, and Indonesia. Developed sustainable reservoir concepts for many geothermal fields by coordinating geoscientific, reservoir engineering and drilling/completion of geothermal projects. Developed innovative well architectures to maximise heat extraction in a sustainable view. He lectured on Geothermal Reservoir Simulation and Sustainable development of geothermal resources at CAS-DEGEOSYS (University of Neuchâtel), several ISS (International Summer School) and seminars. Authored and co-authored over 75 technical papers (English and Romanian) and four textbooks. He holds MSc and PhD in Petroleum Engineering from the Ploiesti (Romania) School of Petrol. He also holds a Diploma in Geothermal Energy Technology from Geothermal Institute in New Zealand. He is President of the European Geothermal Council (EGEC) since 2018. Member of IGA, EGEC, EAGE, GRC, SPE.

Lecture:
Case study - Paris Basin

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Eszter Békési obtained her MSc degree in Geophysics at the Eötvös Loránd University in Budapest (Hungary) in 2016. She performed her PhD studies at the Utrecht University (The Netherlands) in the framework of H2020 European geothermal projects (IMAGE, GEMex) and obtained her degree in 2021. She is currently working as a research fellow at the HUN-REN Institute of Earth Physics and Space Science, Sopron, Hungary. Her research primarily focuses on the understanding of the thermal structure and stress state of the lithosphere and deformation processes of geoenergy systems, using methods such as numerical modelling, satellite-based ground motion mapping, and the integrated analysis of geophysical and geological datasets.

Lecture:
Case studies - Thermal and mechanical modelling in the Pannonian Basin

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Brigitta Czauner, PhD is assistant professor at the Department of Geology, Faculty of Science, Eötvös Loránd University (Budapest, Hungary), and researcher of the József Tóth Hydrogeology Chair. Her main research interests are in basin hydrogeology and oil-hydrogeology, both with a focus on the hydraulic conditions of groundwater flow systems. She is a board member of the IAH Regional Groundwater Flow Commission and faculty advisor of the AAPG Eötvös Student Chapter.

Lecture:
Case studies - Flow systems in the Pannonian Basin and their geothermal consequences

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Attila Galsa received his MSc degree in Geophysics in 1997 and PhD degree in Earth Sciences in 2004 from Eötvös Loránd University (ELTE), since then he has been working at the Department of Geophysics and Space Science at ELTE, currently as an Associate Professor. His research interests include numerical modelling of groundwater flow, with special emphasis on heat, solute and age transport, mantle convection and DC borehole geophysical probes. In parallel, he has been working as a consultant at Geo-Log Environmental and Geophysical Ltd. for more than 20 years, where he is mainly involved in the evaluation of well tests of thermal wells.

Lecture:
Geothermal well-tests
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Gregor Götzl studied geophysics at the University of Vienna and was in charge of the geothermal energy department at the Federal Geological Institute / GeoSphere Austria from 2004 to 2022. Since May 2023, Gregor Götzl has been responsible for the development of geothermal heating systems at EVN Wärme GmbH Gregor Götzl is a founding member of the Austrian Geothermal Energy Association and was secretary of the Austrian Geothermal Energy Association in the 2021 - 2023 board period.

Lecture:
Case study - Molasse Basin

E-mail: gregor.goetzl@evn.at

Sanjeev Kumar Sanjeev is the Head of Policy at the European Geothermal Energy Council (EGEC). He is the Founder of Change Partnership – a think tank focused on solving the politics of climate change. Previously, he was an advisor to Chris Davies MEP, Chair of the PECH Committee in the European Parliament, Director of energy at Burson Cohn & Wolfe Senior Associate at E3G, ETS coordinator at the WWF European Office and Business Affairs Manager at the Energy Institute in the UK. He read history at Queen Mary, University of London.

Lecture:
Introduction: the role of geothermal energy in the green transition, geothermal state-of-the-art and future trends

E-mail: s.kumar@egec.org

László Lenkey is an Associate Professor at Eötvös Loránd University, member of the Hungarian Academy of Science, received his PhD from the Vrije Universiteit, Amsterdam. His primary research scope are: heat flow determination, construction and interpretation of heat flow maps, temperature modelling, investigation of the heat flow in the Pannonian Basin, numerical modelling of groundwater flow: hydraulic and compaction flow modelling, thermal convection modelling, dynamics of the Pannonian Basin, geoelectric measurements and method development, magnetic measurements for geological and archaeological research.

Lecture:
Thermodynamics of geothermal systems

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Ábel Markó received his MSc Degree from the Eötvös Loránd University in 2020, and carried out his PhD research as a member of the Tóth József Hydrogeology Chair. His main topic focuses on the sustainable use of thermal water resources, reinjection related issues in porous aquifers, and the approaches on predicting and mitigating the problems. He is lecturer at the Eötvös Loránd University responsible for geothermal courses. Currently he is employed as energy specialist at the Supervisory Authority for Regulatory Affairs of Hungary.

Lectures:
The geological context of conceptual play, reservoir characterisation models
Challanges of reinjection into porous aquifers

E-mail: abel.marko@sztfh.hu

Gábor Molnár is a project manager and designer of geothermal energy projects in Hungary, Europe and worldwide. He joined Mannvit in 2008, started to work at the headquarter in Reykjavík, Iceland. His engineering tasks included general building and geothermal heating projects in Iceland and later in Hungary. In the last 15 years, Gábor was participated in geothermal energy utilization projects – both direct heat use and electricity production – as senior designer, construction manager, and project manager. He was the overall project manager of the development of the first Hungarian geothermal power plant in Tura. Gábor was the Managing director of Mannvit Kft from 2019. From 2023, he is the Managing Director of Arctic Green Engineering.

Lecture:
Introduction: Process of geothermal project development

E-mail: gabor@arcticterv.hu

Annamária Nádor – senior geologist of the Supervisory Authority for Regulatory Affairs of Hungary – has more than 15 years of experience in deep geothermal systems, especially resource assessment, utilization and management strategies of transboundary geothermal reservoirs in Central Europe. She has been participating in numerous EU-funded geothermal projects and worked as project manager in several of them. She was the member of the international expert team elaborating the United Nations Framework Specifications (UNFC-2019) for geothermal energy. She was one of the initiators of the Hungarian geothermal risk mitigation scheme and the Hungarian Geothermal Information Platform – OGRE. Addressing the current energy crisis, she has been working on strategies how to accelerate geothermal developments in Hungary. She is the Chair of the Geo-Energy expert group of the European Geological Surveys and also the Energy Priority Area coordinator of the EU Strategy for the Danube Region.

Lectures:
The geological context of conceptual play, reservoir characterisation models
Resource assessment and classification methods

E-mail: annamaria.nador@sztfh.hu

Imre Szilágyi is geologist and economist with 35 years of experience in the exploration of natural resources. He holds M.Sc. equivalent degree in Geology from Eötvös Loránd University, Budapest and an MBA (finances) from the Budapest University of Technology and Economics. Between 1999 and 2017 he filled various senior management and advisory positions with the E&P Division of MOL Hungarian Oil and Gas Plc., while later on worked as independent consultant for oil companies, as well as Visiting Lecturer of petroleum geosciences at his Alma Mater university. In 2021 his career path turned from hydrocarbon to geothermal exploration. Currently he is employed as geothermal advisor at MVM Green Generation private limited company focusing on renewable energy production. Imre plays a pioneering role in introducing geological risk assessment methodologies in hydrothermal exploration.

Lecture:
Geological risk assessment in hydrothermal exploration

E-mail: szilagyi.imre@mvm.hu

Teodóra Szőcs has a PhD on flow systems and water-rock interaction from the Eötvös Loránd University (2006). She became Head of the Hydrogeology Department in 2007 at the Geological Survey, now at the Supervisory Authority for Regulatory Affairs. Her main research areas are groundwater surveys and hydrogeochemical evaluation, particularly arsenic, water-rock interaction, and hydrogeological modelling of flow systems, including stable and radioactive isotopes. For the past decade she focused on joint surveys of transboundary aquifers, on thermal-water geothermal energy resource evaluation and management and on lithium resource research. She is an invited lecturer in hydrogeochemistry at the University of Miskolc. Since 2024 she is the president of the International Association of Hydrogeologists.

Lectures:
General framework background of hydrogeological investigations
Hydrogeochemistry and isotope geochemistry in thermal waters
Integrated management of thermal water resources and interaction of geothermal energy utilisation with groundwater

E-mail: teodora.szocs@sztfh.hu

Jan-Diederik van Wees is principal scientist geothermal research at TNO, and professor at Utrecht University. His current research expertise focuses towards geothermal energy development in the Netherlands and internationally. Van Wees serves in various co-ordinating roles in major European and Dutch geothermal research projects, including sub-program management (resource assessment) in the Joint Program on Geothermal Energy of the European Energy Research Alliance and vice president of the European Technology and Innovation Platform for Deep Geothermal Energy (ETIP-DG) for the SET-PLAN. Under his leadership, TNO has developed various state-of-the-art geothermal information systems and performance assessment methodologies, including thermoGIS and the portfolio approach for accelerating geothermal development in the Netherlands.

Lecture:
Economic considerations: techno-economic performance assessment of geothermal reservoirs

E-mail: j.d.a.m.vanwees@uu.nl

Anita Erőss is a hydrogeologist with a PhD from Eötvös Loránd University, Hungary, and over two decades of experience in karst hydrogeology, groundwater geochemistry, and environmental radioactivity. She has been active participant in multiple national and EU-funded research projects, including Horizon 2020 and the National Multidisciplinary Laboratory for Climate Change. She teaches courses related to karst hydrogeology. Anita also plays a key role in science communication and conference organization, as currently serves as President of the Hungarian Chapter of the International Association of Hydrogeologists and Congress chair of IAH World Groundwater Congress 2026.

Lecture:
Hydrogeology of the Buda Thermal Karst

E-mail: eross.anita@ttk.elte.hu

Ágnes Rotár-Szalkai graduated as a geologist and post graduated as an environmental engineer. She has more than 20 years of experience in geothermal energy resource evaluation and management and in hydrogeology. As a key expert she was involved in several international geothermal projects (T-JAM, TRANSENERGY, DARLINGe) and participated in different national geothermal resource assessments. She is a specialist of planning and operating environmental monitoring systems, currently she is responsible for the National Hydrogeological Monitoring System of the Supervisory Authority for Regulatory Affairs of Hungary.

Lecture:
Monitoring of thermal water use, data reporting

E-mail: agnes.szalkai@sztfh.hu

Márton Palotai is a geologist with a background in structural geology, tectonics, and basin analysis. With over 15 years of professional experience, he has worked extensively in both academic and industry settings, demonstrating expertise in structural modelling, geological mapping, and seismic interpretation. He currently serves as the Head of the Geology and Laboratory Department at the Supervisory Authority for Regulatory Affairs of Hungary, where he oversees diverse geological projects and contributes to national regulatory frameworks. He earned his PhD from Eötvös Loránd University, where he also served as an assistant professor. He worked as the leader of the Dinarides-Hellenides project at CASP, Cambridge, directing field-based tectonic studies and regional basin analysis across the Balkans. His expertise also extends to hydrocarbon systems, having contributed to prospect analysis and geological modelling in the Pannonian Basin, Balkans, Zagros, Oman, and the North Sea for major oil and gas companies. He serves as Hungary's national delegate to EuroGeoSurveys, where he actively contributes to European geological mapping and modelling initiatives.

Lecture:
3D geological models as a framework

E-mail: marton.palotai@sztfh.hu

Nóra E. Gál holds an MSc in Geology from Eötvös Loránd University, Budapest, and a PhD in Earth Sciences from University of Massachusetts at Amherst. She is a senior hydrogeologist with more than 35 years of experience at the Supervisory Authority for Regulatory Affairs, Geological Survey, Hungary. Her research focuses on hydrogeochemistry, data processing, geochemical modelling, regional hydrogeology problems, especially on karst areas, and geothermics. She participated in numerous international research programs focusing on hydrogeology and geothermal related research, like Transenergy, Darlinge, GeoEra and GSEU. She is involved in the planning and maintenance of the National Geothermal System (OGRe) webpage.

Lecture:
Data management

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Renáta Szebenyi studied geophysics at the Eötvös Loránd University and received her MSc Degree in 2023. She has been working at the Supervisory Authority for Regulatory Affairs of Hungary since 2022 where she is responsible for magnetotelluric research. Her main interests include shallow and deep penetrating geoelectric measurements and solving various tasks by programming.

Lecture:
Gravity, magnetics, and magnetotelluric methods

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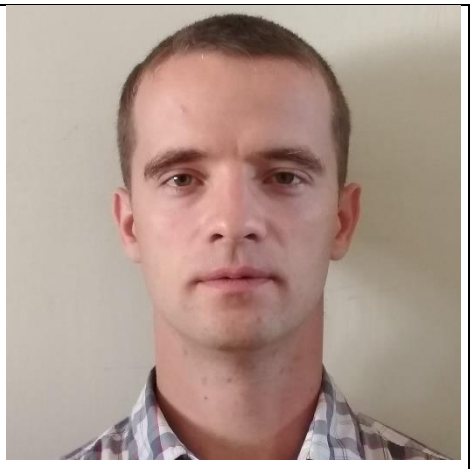
Ernő Takács received his PhD degree from the University of Miskolc (Hungary) in 2001. His doctoral theses were performed on the application possibilities of Amplitude Versus Offset (AVO) analysis. After completing his PhD study, he had the opportunity to work for the Department of Earth Sciences, University of Saskatchewan (Canada) for more than ten years, in two longer periods. During those times, he was involved in several uranium exploration projects. He returned to Hungary back in 2015 and currently he is working for the Geological Survey of the Supervisory Authority for Regulatory Affairs (Hungary) as a Geoscience Referee. His professional field includes seismic data processing, joint processing of seismic and well logging data (AVO and Simultaneous Model Based inversions), and the lithological and porosity related interpretation of the resulted rock physical models. He is also experienced in the conventional geological and structural interpretation based on complex geophysical data mainly for deep seismic and geothermal purposes. In addition to his research work, recently, he is teaching international students at the Institute of Exploration Geosciences, University of Miskolc (Hungary).

Lectures:
Geophysical exploration methods - 2D & 3D seismics
Case studies - Seismic exploration

E-mail: erno.takacs@sztfh.hu

György Bernáth obtained his MSc degree in Geology in 2010, followed by a second MSc in Geophysics in 2012 from Eötvös Loránd University, Budapest. As an employee of Geo-Log Ltd., he has gained over ten years of experience in the evaluation of well-logging, production logging and well construction measurements carried out in boreholes of various depths ranging from several tens to several thousand meters established for groundwater or thermal water exploration, geotechnical, or geological research purposes. Currently he is employed as a geophysicist at the Supervisory Authority for Regulatory Affairs of Hungary.



Lecture:
Geophysical well logging

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Tamás Lukács is currently the head of the Geophysics Unit at the Geological Survey of Hungary. He obtained his MSc in exploration geophysics in 2017. Previously he worked in hydro- and engineering geophysics. His main interests are electromagnetics and shallow geophysics.

Lecture:
Geophysical methods in geothermal exploration - introduction & overview

E-mail: tamas.lukacs@sztfh.hu

Gyula Maros PhD – senior geologist at the Geological Survey in the Supervisory Authority for Regulatory Affairs – has more than 40 years of experience in various geological research topics. Besides the structural geologic field work, he participated in numerous applied geological projects in the field of nuclear energy and geothermal systems. He has participated in numerous EU-funded geothermal projects mainly in the implementation of the basic geotectonic 3D models of the target areas. He has a special interest in high resolution borehole log interpretation. He has developed the ImaGeo® hardware and software system for the documentation of boreholes, outcrops and mining sites. He uses large data sets for building 3D models, depicting detailed deformation history, making cyclostratigraphic analysis. He lead the Geological Research Department of the Hungarian Geological Survey for 21 years, and the Regional Geological Department at the Eötvös Loránd University for 5 years.

Lecture:
3D geological models as a framework

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Márk Szijártó is a postdoctoral researcher in geophysics at Eötvös Loránd University (ELTE), Budapest. His work focuses on the numerical modeling of regional groundwater flow systems, with broader research interests in deep and shallow geothermal energy, groundwater remediation, and the application of geoelectric and geoinformatics methods. He holds a Ph.D. in Earth Sciences from ELTE, where he also earned his MSc and BSc degrees in geophysics and physics. In addition to his research, Márk is actively involved in teaching at both BSc and MSc levels, delivering courses in hydrogeology, geoelectrics, GIS, and data visualization. He is a committed mentor and research coordinator, supporting student research activities.

Lecture:
Introduction to hydrogeological modelling

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István Vass is a geologist – hydrogeologist, received his PhD in the subject of fracture network analysis and hydrodynamic and heat transport modelling of basement fluid reservoirs in 2014. Started his career at the University of Szeged as a research fellow then worked as a geothermal expert in Western Australia and Hungary. Joined to MOL as a wellsite geologist, later moving into the position of chief operations geologist. Currently leading the subsurface geothermal explorations as a Technical Lead.

Lecture:
Drilling process in geothermal

E-mail: isvass@mol.hu

Andrea Szűcs was graduated in geology at ELTE in 1993 and received her PhD degree in the field of environmental geochemistry at the Uppsala University, in 2006. After her graduation she joined the Hydrogeology Department of the Geological Survey, SARA (Supervisory Authority for Regulatory Affairs). She has worked on a wide range of topics related to groundwater quality. Some of her key competences include groundwater quality time series analysis, complex investigation of the hydrogeochemical processes in surface water – groundwater interaction, groundwater quality research in support of river basin management and hydrogeochemistry, sampling and monitoring issues of thermal waters.

Lecture:
Hydrogeochemical aspects of reinjection

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