

Karst Commission

In this issue

- Note from the chairs
- Special request from the IAH
- New member of the KC group
- Webinar proposal and project description
- Upcoming KC events
- Recommended publications

November 2023 NEWS

<u>Chairs:</u> Peter Malik (Europe/Africa, 9/21 - 12/22); Avi Burg (Asia/Oceania, 1/23 - 4/24); Benjamin Tobin (Americas), 5/24 - 8/25)

Note from the chairs

This is the time when we all receive new offers to participate in conferences and meetings during 2024 as well as requests to send abstracts. Some such proposals are listed below and you are invited to join and send abstracts. If you want to share an interesting and relevant conference or course with the KC members, you are welcome to send an email to the chair in charge, Avi (<u>burg@gsi.gov.il</u>), and he will publish it in the next KC news.

In addition, we encourage you to tell the group about an interesting project that you are leading. In the previous KC News, our friend Zoran Stevanović updated us about his global project MIKAS, and in the current News, our new friend Jean-Christophe Marechal tells us about his project titled: *"The DEM'EAUX THAU: management of groundwater resources in a coastal karst aquifer"* (see below). We also ask and encourage you to propose and initiate new projects with other members using the platform of the KC.

Lastly, the current chairmen together with the previous chairmen of the group have discussed the way in which the tradition of geotrips should be continued. The first decision is that geotrip will be implemented every two years. Our friend Neven Kresic volunteered to organize the next geotrip in the area of Ozarks (Missouri, USA) during the spring of 2025. In mid 2024 we will start organizing it ... There is something to look forward to!!!!!!

Special request from the IAH

See the attached request from the IAH Executive Committee:

Dear Colleagues,

Many of you recently expressed an interest in contributing to the work of an IAH-United Nations working group and we thank you for this. We would be grateful if you could confirm if you would like to be an active member of the IAH-UN working group and the type of input you would be prepared to make; and/or if you have colleagues who would be able and willing to represent IAH in its work with the UN family.

IAH's Executive Committee and Council have been considering for a while how best to coordinate its work with the UN. During this period there has also been a proposal for UN Water to establish an Expert Group on Groundwater. This was accepted by UN Water and we attach the Terms of Reference for the Group (see below). IAH has two members in the Group, Dave Kreamer and Alice Aureli. It is expected that the IAH-UN WG will also work closely with the Expert Group. Support and coordination for the IAH-UN WG will be provided by IAH's Secretariat.

Other current requests for inputs to the UN and related activities include:

- World Water Day 2024 Task Force
- Drafting of the World Water Development Report 2024
- Drafting of the World Water Development Report 2025
- Committee on Non-Governmental Partners of UNESCO
- UN-Water Task Force on Innovation
- UNECE Water Convention Working Group on Monitoring and Assessment
- UNECE Convention Workshop
- Working with UN Water for inputting to World Water Forum 2024
- UNESCO Capacity Development Initiative (CDI)
- UN Environment Programme, though Friends of Groundwater (FOG), working with the World Water Quality Alliance

Please let us know what you think the IAH-UN WG can do for UN organizations, with the aim of 'getting IAH's message across'. Let us know how we should organize the work of the group e.g. international or regional matters, topic and campaign, specific UN organization – and how you would like to contribute.

For those of you who are part of or more directly involved with UN organizations, let us know the type of support you would hope to receive from the WG.

Dave Kreamer, Jane Dottridge, Teodóra Szőcs, Marco Petitta

IAH Executive Committee

For those interested, see below the two attached files.

Application Form

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New member of the KC group

We are pleased to welcome Dr. Jean-Christophe Marechal from the BRGM in Montpellier, France, as a new associate member of the KC Group. Here is what

Jean-Christophe wrote about himself:

Email: jc.marechal@brgm.fr

I do research on a broad range of scientific questions in hydrogeology and water resources management. My main topic of interest is fractured and karst hydrogeology. I am the Head of the NRE research group (Nouvelles Ressources en Eau et Economie - New Water Resource and Economy unit), and Deputy Director of the G-eau lab (the joint research unit "Water Management, Actors, Territories").

My interest in karst hydrogeology is related to the role of drainage conduit networks on the response of karst aquifers to external forcing. It comprises the analysis of drawdown data during pumping tests for proposing well-suited hydrodynamic models for their interpretation and simulation. Also, I try to understand the relationships between karst conduits and fractured matrix during flood events on karst watersheds. My objective is to elaborate simple and robust modeling tools for improving water resource management in karst areas.

I am a member of the French chapter of the IAH. I have coordinated the karst hydrogeology group of the <u>RESOURCE</u> GeoERA project; gathering all Eurogeosurveys, for harmonizing methods and tools of karst hydrogeologists at the European scale.

A list of Jean-Christophe's publications can be found at: http://orcid.org/0000-0001-8179-1294



Webinar proposal and project description

In the October KC News, we published a request from the IAH secretariat team to propose topics for webinars. Our new member - Jean-Christophe Marechal of BRGM in Montpellier, France, informed us that he has submitted a proposal for a webinar on the Vise submarine karst spring. This topic may be of interest to many of us. See below the details of the webinar proposal as written by Jean-Christophe:

<u>Title</u>: Flow reversal and saltwater intrusion at the submarine spring of a Mediterranean karst aquifer

<u>Abstract</u>: For the first time in hydrological sciences history, we have monitored a full flow reversal at a submarine spring. We have used an innovative device specially designed for that purpose. During the recent flow reversal that happened at the Vise submarine spring, located below the Thau lagoon (France) connected to the Mediterranean Sea, we measure the flow rate, temperature, and salinity of the water. During 471 days (from 28 November 2020 to 14 March 2022), more than 6.7 Mm3 of

salt water and more than 200,000 tons of salts infiltrated into the freshwater aquifer. We explain the long duration of the phenomenon by a sudden increase of water head at the spring due to the sudden filling by saltwater of a vertical karst conduit connecting the spring to the karst aquifer. This phenomenon creates also a piezometric wave into the aquifer flooding cellars and underground parking. In the context of future climate change, this kind of phenomenon will be more frequent due to the rise of sea level and decrease of aquifer natural recharge.

When a date is set for the webinar, we will update you.

Following our request, Jean-Christophe wrote a paragraph with more details about his project and it is attached below:

The DEM'EAUX THAU project: management of groundwater resources in a coastal karst aquifer project:

The Vise spring is the main outlet of a Jurassic karst aquifer located close to Montpellier city, South of France. This karst spring is submarine, located at the bottom of the Thau Lagoon at a depth of 30 m. The lagoon, made up of brackish water is connected to the Mediterranean Sea. The freshwater from the karst aquifer as a whole, and especially from the spring, contributes to the qualitative state of the Thau Lagoon, which is well known for shellfish farming activities.

During the last fifty years (from 1967 to today), several occasional flow reversals and saltwater intrusions (called "inversac" in French) occurred, inversing the water flow at the submarine spring during a period varying from a few weeks to a few months. This flow reversal process at the spring induces a very large saltwater intrusion into the karst aquifer. Given that this aquifer provides several highly important ecosystem services (drinking water supply for the coastal villages, fresh water to the lagoon, thermal water to Balaruc spa, and health resort), a large scientific program of groundwater monitoring has been launched. Offshore in the Thau Lagoon, the submarine Vise spring was equipped with flow recording devices as well as electrical conductivity and temperature monitoring sensors. Onshore but close to the spring, three boreholes of 45 m, 168 m, and 300 m deep each were drilled near an existing thermal borehole, and a deep borehole including fiber-optic distributed temperature sensing (FO-DTS) has been drilled. Sub-hourly observations of pressure, electrical conductivity, and temperature in these boreholes and in the lagoon, as well as synoptic measurement campaigns, focused on groundwater chemistry, complete a monitoring network of about twenty boreholes and springs spread across the territory.

In November 2020, a seventh flow reversal event started and has been observed with the new monitoring system. From an initial flow rate of about 60 l/s from the aquifer to the lagoon through the spring, the flow inverted to about 350 l/s from the lagoon to the aquifer in a few minutes on the 28th November 2020 at 9:40 AM. This sudden flow reversal created a sudden water level rise of about 2.3 meters in the karst-confined aquifer. During 471 days (from 28 November 2020 to 14 March 2022), more than 6.7 Mm3 of salt water and more than 200,000 tons of salts infiltrated into the freshwater aquifer.

A physical mechanism is proposed to explain the sudden inversion of flow and its long duration after the event has started (see figure below). The propagation of a piezometric wave through the aquifer is simulated using simple analytical solutions. A preliminary meshed model of the aquifer and its interactions with the lagoon has been developed to identify the main processes. A tool calculating alert indicators based on available data has been developed and is now used by local stakeholders. Here is a link to the project web page:

https://www.brgm.fr/fr/reference-projet-acheve/dem-eaux-thau-gestion-ressourceseau-souterraine-aquifere-cotier-karstique

A link to a video describing the flow reversal: <u>https://youtu.be/v4yL7uvGg_E</u> Data paper in Data In Brief journal:

https://www.sciencedirect.com/science/article/pii/S2352340923006571?via%3Dihub





UPCOMING KC EVENTS

Eurokarst 2024

The EUROKARST 2024 will be held in the main campus of Sapienza University, central Rome, between June 10 and 14, 2024. The abstract submission is still open until the end of November. We warmly invite you to contribute to the conference by submitting your work, and by sharing this information among your network. Each author may submit only one abstract as a corresponding author (but she/he may appear as a co-author in other abstracts).

For abstract submission, please use the following link:

https://eurokarst2024.sciencesconf.org/

Guidelines for authors are available at:

http://www.eurokarst.org/authors-guidelines-2022/

You can find out more details at: http://www.eurokarst.org



Rome, June 10th-14th 2024

The IAH World Groundwater Congress 2024

After Wuhan and Cape Town, the World Groundwater Congress is back in Europe. With its central location in Europe, a long tradition as a meeting place, and its scenic surroundings, Switzerland offers an ideal setting to meet, exchange new findings, and discuss pressing challenges in the groundwater field.

The Swiss Society of Hydrogeology (SSH) and the Centre for Hydrogeology and Geothermics of the University of Neuchâtel (CHYN) welcome you to Davos in the Swiss Alps for a stimulating IAH World Groundwater Congress 2024.

The IAH World Groundwater Congress 2024 will be held from 8 to 13 September 2024 at the renowned Davos Congress Centre, Switzerland. The conference is organized around four main topics: (1) Hydrogeological systems and processes, (2) Groundwater as a resource, (3) Groundwater and society in a changing world, and (4) Emerging field and computational approaches.

The KC intends to offer 2 sessions that will focus on different aspects of karst studies. When the program is set, we will ask you to send abstracts to these sessions.

For more preliminary details look at: www.iah2024davos.org

Water In Sensitive and Protected Areas (WSPA2024) - Pula, Croatia, April 10 - 13, 2024

The 4th International Conference WATER IN SENSITIVE AND PROTECTED AREAS (WSPA2024 Conference) will be held in Pula, Croatia on April 10-13, 2024.

On the conference website <u>www.wspa2024.org</u>, a SECOND NOTICE about the conference has been published, which provides potential authors and conference participants with relevant information about the conference, including information about: the conference program; thematic areas and conference topics; invited speakers by topic; preparation and submission of abstracts and full papers; opportunities for publication of full papers in international IWA journals (in English) as well as in the journal Hrvatske vode (in Croatian); workshop and round tables that will take place during the conference and post conference tours (excursions).

Submission of Abstracts has already ended!

For more details see: www.wspa2024.org.

Characterization and Engineering of Karst Aquifers – CEKA

The international course "Characterization and Engineering of Karst Aquifers – CEKA" will be held in Trebinje, Bosnia and Herzegovina from May 26 to June 1, 2024.

This international course includes theoretical lectures on the basic concepts of karst hydrogeology and a few practical demonstrations and field trips within the territories of the Dinaric karst. The course will be organized by The Centre for Karst Hydrogeology of the University of Belgrade, supported by UNESCO-IHP and several other institutions. The course is open to all but is especially devoted to younger and talented karst researchers. Attendance is free of charge.

Preliminary application form for CEKA 2024 can be found at the links below. Number of participants is limited, so hurry up! <u>https://www.karst.edu.rs/en/ index.html</u>

Visual KARSYS GeoModelling Course N6: 5-6 December 2023

The next GeoModelling course N6 will be organized in two sessions. Dates for the course are: Tuesday, December 05th, 2023 - from 1 PM to 4 PM* Wednesday, December 06th, 2023 - from 1 PM to 4 PM* *(GMT+00:00 Time zone)



This course is dedicated to learning the construction of 3D geological models with the implicit approach. Participants will be briefly introduced to the theoretical aspects of 3D geoModelling and will be guided through the construction of a 3D geological model in a folded/eroded/thrusted environment by using different geological data (maps, cross-sections, drillholes, galleries, faults, etc.). The course is dedicated to geologists/hydrogeologists working in complex areas.

Course fee: employees CHF 180 / students CHF 130

Contact for registration/questions: info@visualkarsys.com

For the program of the course go to: https://www.visualkarsys.com/courses



Recommended publications

Attached below is a list of new articles presenting various aspects of karst issues in different countries: USA, Vietnam, Brazil, China, and Slovakia. The topics of the articles include multi-year hydrograph analyses to predict impacts on aquifers (1); use of geochemical characteristics to identify hydrochemical processes occurring in karst systems (2); estimation of the annual recharge rate using different methods (3); assessment of the contributions of karst spring discharge, precipitation, water temperature, and specific conductance to DO concentrations in karst spring flow (4); investigation of nitrate sources and their perturbations on cave hydrogeochemistry in karst cave systems, and assessing the impact of human activities on the karst carbon cycle and the environment (5); providing a methodological reference for the discharge prediction of springs by proposing a delay-aware spring discharge prediction framework (6); identifying the intensity of chemical denudation of carbonate rocks and their relatationship with various factors such as the dynamics of seasonal changes throughout the year, including precipitation, temperature, and the length of the vegetation growing season period (7).

(1) Chambless, H.E., Springer, A.E., Evans, M. and Jones, N., 2023. Deep-karst aquifer spring-flow trends in a water-limited system, Grand Canyon National Park, USA. Hydrogeology Journal, 1-17.

(2) Tran, D.A., Goeppert, N. and Goldscheider, N., 2023. Use of major ion chemistry and trace and rare earth elements to characterize hydraulic relations, mixing processes and water-rock interaction in the Dong Van Karst aquifer system, Northern Vietnam. *Hydrogeology Journal*, 1-19.

(3) Teixeira, G.M., de Paula, R.S., Velasquez, L.N.M., Andrade, I.B. and Neto, W.M.P., 2023. Evaluation of recharge estimation methods applied to fissure and karst aquifers of the Lagoa Santa Karst Environmental Protection Area, Brazil. Hydrological Processes, 37(8), e14971.

(4) Zhou, R. and Zhang, Y., 2023. Predicting and explaining karst spring dissolved oxygen using interpretable deep learning approach. Hydrological Processes, 37(8), e14948.

(5) Zhou, Z., Ding, S., Xiong, Y., Shi, L., Su, D., Gong, X., Dond, H. and Yan, L., 2023. Nitrate sources and their influence on hydrogeochemistry in karst caves of Southwest China. International Journal of Earth Sciences, 1-14.

(6) Li, S., Zhou, Y., Cheng, J. and Yao, H., 2023. Delay-aware Karst Spring Discharge Prediction. Journal of Hydrology, 130250.



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