

## Short course Visual KARSYS

### A web application for modelling karst aquifers in 3D

#### Dates / attendees:

Because of the COVID-19, the KARSYS course that was scheduled in the frame of the 28<sup>th</sup> International Karstological School is replaced by an online course. In order to make the lesson more comfortable, the course is split in two days (3 hours per day).

Dates are:

- Thursday, June 18<sup>th</sup>, from 1 PM to 4 PM\*
- Friday, June 19<sup>th</sup>, from 1 PM to 4 PM\*

\* GMT+00:00 Time zone

#### Equipment / facilities:

Participants are supposed to work on a laptop which is connected to Internet (preferably with an Ethernet cable and not via Wifi). Last versions of [Google Chrome](#) or [Mozilla Firefox](#) must be installed.

For the course, we will share a [Zoom](#) / or a [Microsoft Teams](#) session. Be sure your computer is compatible with these apps (including microphones, front-camera and headphones).

Participants can already create an account on [visualkarsys.com](http://visualkarsys.com).

**Instructors:** Dr. Pierre-Yves Jeannin, Dr. Arnaud Malard (ISSKA, CH).

This workshop is dedicated to the learning of the KARSYS approach through an application on a pilot site by using the Visual KARSYS web-tool ([www.visualkarsys.com](http://www.visualkarsys.com)). Participants will be introduced in theoretical aspects of the approach and in the practical process of its application.

**KARSYS** is developed for geologists and hydrogeologists working in karst regions, in order to address questions related to aquifers and groundwater in a very pragmatic and concrete way. KARSYS makes it possible to build an explicit model of the karst aquifers and of the associated flow systems. The approach is based on a 3D model of the aquifer synthesizing all standard geological and hydrological data and coupling a series of simple hydraulic principles. This provides, within a limited effort, a consistent hydrogeological conceptual model of the flow systems within any investigation area. The course is designed for



hydrogeologists with basic knowledge on karst, hydrogeology and 3D modelling. Any professional interested in groundwater management, engineering, renewable energies in karst environments will gain a good understanding of karst hydrogeology and a pragmatic way to assess karst hydrogeological systems.

**Any questions! Please contact:** [arnauld.malard@isska.ch](mailto:arnauld.malard@isska.ch)

**Short course agenda:**

**PART 1 / June, 18<sup>th</sup>:**

*1 pm GMT – start of the course*

Brief presentation of the participants / instructors (10 minutes)

Introduction to the KARSYS approach (30 minutes):

- Concepts
- Applications
- Limitations

Presentation of the web-tool (10 minutes)

- creation of user's account
- Presentation of the "Community Portal"

Presentation of the test site and of the dataset (10 minutes)

*2 pm GMT*

Proceed steps (60 minutes)

- SETUP (DEM, maps, drillholes, etc.)
- HYDROSTRATIGRAPHY

*3 pm GMT – Break*

*3:15 pm GMT*

Proceed the GEOLOGY step (45 minutes)

- Introduction to implicit modelling
- Principles of data implementation
- Faults
- Run computation and meshing

Exercise for the day after (explanations, 15 minutes)

*4:15 pm GMT – end of the course*



## **PART 2 / June, 19<sup>th</sup>:**

*1 pm GMT – start of the course*

Continue the GEOLOGY step (30 minutes)

- Results of the exercises
- feedbacks

Proceed the GROUNDWATER step (30 minutes)

- Introduction of springs
- Modelling groundwater body

*2 pm GMT*

Proceed the FLOWS & CATCHMENT step (30 minutes)

Presentation of the OUTPUT page (30 minutes)

- 2D / 3D views
- Create layers and profiles
- Save workspace
- Export / print

*3 pm GMT – Break*

*3:15 pm GMT*

Additional functionalities (10 minutes)

- Permissions
- Project's publishing

Extensions to Visual KARSYS (30 minutes)

- What will be developed in 2020?
- What will be developed later?
- What could be done aside Visual KARSYS?

Questions, feedbacks, varias (20 minutes)

*4:15 pm GMT – en of the course*



### **About Instructors:**

**Pierre-Yves Jeannin (SISKA)**, Ph.D., is hydrogeologist, Director of the Swiss Institute for Speleology and Karst-Studies and Invited lecturer and researcher at Centre d'hydrogéologie (Univ. Neuchâtel). He is a researcher on karst hydrogeology since 1988 and closely supervised several PhD-theses related to the understanding and modelling of flow and mass transport in karst systems. He also took part to the development of methods for the evaluation of the vulnerability of karst groundwater (EPIK and VULK). Pierre-Yves supervised several research projects on the infiltration of water in karst regions, showing the very important role of the soils and the epikarst (weathered zone at the top of limestone) for absorption, temporary storage and the self-purification of water. In 2009, he successfully submitted the Swisskarst project to the Swiss National Science Foundation on the sustainable management of water (PNR61). The KARSYS approach developed in this project induces a high degree of interest among the water community because it provides an explicit 3D conceptual model of karst hydrogeological systems.

**Arnauld Malard (SISKA)**, Ph.D., is scientific collaborator at SISKA since 2011 and specialist for 3D modelling and flow simulation. He works as hydrogeologist for 15 years in different public offices and private companies in France and overseas department. He is member of the French geological society and responsible for several publications in karst and volcanic aquifers. Arnauld Malard was the main actor for the development of KARSYS in the frame of the Swisskarst project (2011-2013). He is now in charge of the implementation of new functionalities on Visual KARSYS (flow-simulation tools, conduits generation, etc.).