

## **Short course KARSYS: applied and innovative methods for the management of karst environment**

**Date / place:** Sunday 22<sup>nd</sup> September, 2019 / Malaga, Spain, Room A.0.1

**Instructor:** Dr. Pierre-Yves Jeannin (ISSKA, CH).

**Price of the course:** 150 €

This workshop is dedicated to the learning of the KARSYS approach through an application on a pilot site by using the Visual KARSYS web-service which is under development (<https://visualkarsys.isska.ch/>). Participants will be introduced in theoretical aspects of the approach and in the practical process of its application.

**KARSYS** is developed for hydrogeologists working in karst regions, in order to address hydrogeological questions in a very pragmatic and concrete way. KARSYS makes it possible to build an explicit conceptual model (3D image) 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 karst 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.

The course will be extended further with an introduction to KarstALEA method, which has been developed for predicting the position and characteristics of karst occurrences within a massif. KarstALEA was initially designed for tunneling, but can be applied to any kind of underground construction in karst areas. At last, an outlook to flow simulation procedures based on KARSYS (KarstFlowSIM) will be presented.

KarstALEA and KarstFlowSIM are both extensions of KARSYS, providing *de facto* a consistent and continuous workflow in karst to address pragmatic issues.

**Key-words:** Karst hydrogeology, Conceptual model, 3D, Water management, KARSYS, KarstALEA, Visual KARSYS, KarstFlowSIM



## **Short course agenda:**

*08:30 – welcome, reception and opening of the course*

*09:00 – start of the course*

Introduction to the KARSYS approach

*10:30 – 11:00 – coffee break*

*11:00 – 12:30 – lecture & exercise*

Introduction to Visual KARSYS (<https://visualkarsys.isska.ch/>):

- Presentation of the web-tool
- Creation of user's account
- Application on a pilot site
  - o Data integration
  - o 3D-geological modelling

*Lunch break (12:30 – 14:00)*

*14:00 – 16:00 – return to course*

Application on a pilot site (continuation)

- 3D sketch of the flow system and catchment delineation
- Overview of the output page
- Discussion of the results

*16:00 – 16:30 – break*

*16:30 – 17:30 – lecture & exercise*

Introduction to the extensions to KARSYS (overview):

- KarstALEA: a pragmatic method for the assessment of karst-related hazards in underground construction
- KarstFlowSIM: recharge and hydraulic flow simulations in karst aquifers based on KARSYS model

*17:30 – 18:00 – various questions*

*18:00 - end of the course*



### **About the instructor:**

**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.