Water Resources Management and Engineering Challenges in Karst Aquifers

**Date:** 23rd-24th September 2017  
**Schedules:** 9:00 – 17:00  
**Minimum and maximum number of participants:** 15/45  
**Price:** 250 EUR/ students 150 EUR (includes lunches and refreshments during breaks)  
**Instructors:** Zoran Stevanović, Petar Milanović and Saša Milanović, Centre for Karst Hydrogeology, University of Belgrade / National Committee of IAH for Serbia

The 2-day workshop will explain research of karst environment and development and engineering of karst water resources. The course is taking place in Dubrovnik, Croatia in the heart of worldwide known classical Dinaric karst which is also the birthplace of karstology and karst hydrogeology. This region heavily depends on the sustainable use and control of karst aquifers, as they represent the almost sole water resource for life and development. With karst poljes, dams, artificial reservoirs, water supply intakes and tunnels, caves, specific karst features, underground endemic species, countless project documentation, and experience and knowledge of local experts, Dubrovnik is the ideal place to learn about karst and its specific character. The topics covered will include: 1. karst aquifer characterization; 2. methods for karst aquifer development; 3. control of karst groundwater flow for water supply and hydropower generation; 4. protecting groundwater quality in karst. The attendees will receive theoretical explanations, but will also learn from experiences of many projects conducted in karst worldwide. On the second workshop day they will actively participate in practical exercises called to find appropriate and optimal solutions for various problems which researchers are often facing in karst environment.

**Workshop agenda:**

*Day 1 Saturday morning (09:00 – 13:00)*

15 minutes break  
Karst Aquifer Characterization  
  a. Karstification Process and Features  
  b. Groundwater Flow in Karst Media  
  c. Groundwater Budget – Inflow and Outflow Components  
  d. Research Methods in Karst – Advantages and Limitations  
  e. Basic Principles of Engineering Karstology  
  f. Dinaric Region as Classical Karst  

Lunch break (13:00 – 14:00)  
*Day 1 Saturday afternoon (14:00 – 17:00)*

15 minutes break  
Controlling Waters in Karst Terrains and Aquifer Systems  
  a. Worldwide Utilization of Karst Aquifers

c. Building and Remediating Large Structures in Karst (Dams, Reservoirs, Tunnels)

d. Tapping and Controlling Groundwater Flow in Karst Aquifers

e. Protecting Groundwater Quality in Karst

Day 2 Sunday morning (09:00 – 13:00)
15 minutes break
Case Studies Demonstration
a. Karst Aquifers Utilization - Problems and Solutions
b. Preventing Water Losses in Karst - Problems and Solutions
c. Groundwater Vulnerability Assessment - Problems and Solutions

Lunch break (13:00 – 14:00)
Day 2 Sunday afternoon (14:00 – 17:00)
15 minutes break
Practical Applications and Training
a. Methods Selection and Project Creation
b. Karst Aquifers Physical Modeling and Visualization
c. Design of Water Intakes
d. Organizing Monitoring of Karst Aquifers
e. Groundwater Management: Conflicts and Solutions
f. Towards Sustainable Development of Karst Aquifers

About Instructors:

Zoran Stevanović, Professor and Head of the Centre for Karst Hydrogeology at the Department of Hydrogeology of the University of Belgrade - Faculty of Mining & Geology, Belgrade, Serbia. Vast experience in implementation of research projects concerned groundwater management and aquifer exploitation and control (Algeria, Iraq, Georgia, Bhutan, Seychelles, Somalia, Ethiopia, and Balkans countries). Member of the examination panels and invited lecturer of the universities in Romania, Iraq, Italy, Hungary, China, Iran, Germany. Served as Consultant of the FAO and UNESCO. Member of the Karst Commission of International Association of Hydrogeologists and the Board on Karst and Speleology of the Serbian Academy of Science and Arts. President of the Serbian Geological Society. Head of UNESCO's International Course “Characterization and Engineering of Karst Aquifers” which is taking place in Trebinje, Bosnia & Herzegovina since 2014. Published around 300 papers, wrote and edited 15 monographs and two text-books. The recent are the Elsevier Monograph (co-edited with N. Kresic): “Groundwater Hydrology of Springs: Engineering, Theory, Management and Sustainability” (2010), Springer practical guide-book “Karst Aquifers - Characterization and Engineering” (2015) and CRC monograph “Karst without Boundaries” (2016).
Petar Milanović, Ph.D., Professor Ret. and Consultant for karst hydrogeology and geotechnics. Working for many years on practical engineering projects all over the world. In the early years worked as hydrogeologist for the large multipurpose engineering project “Trebišnjica” in former Yugoslavia. This work resulted in a successful solution found for the regulation of the largest European sinking stream and the utilization of its hydro potential by constructing two dams in a complex geological environment such as “classical” Dinaric karst. The experience he gained on this project, the application of several hydrogeological practice methods for the first time, and several books published on these topics gave direction to his further work as an invited expert in more than 60 international projects involved with construction works in karst (damming, tunneling, water supplying, etc.). President of the National Chapter of IAH in Serbia and still very active in consultancy and teaching. Member of the IAH Karst Commission (since 1973); International Association of Engineering Geology (IAEG); Serbian Association of Engineers (Hydrogeology Chapter); Yugoslav (Serbian) Committee on Large Dams; Member of Editorial Boards of several international journals; Member of the Governing Board of the International Research Centre on Karst (IRCK), Guilin, China under the auspices of UNESCO; Honorary Member of USA National Speleological Society. Author of more than 80 articles related to theory and engineering practice in karst. Author of the books: Karst Hydrogeology (in Yugoslavia, 1979; CRC, Water Res. Publ., 1981); Geological Engineering in Karst (2000); Water Resources Engineering in Karst (CRC Press, Boca Raton, 2004); and Karst of Eastern Herzegovina and Dubrovnik Littoral (2006).

Saša Milanović, Ph.D., Res. Ass., Leading hydrogeologist in several water development programs: water wells in water supply, groundwater protection, karst investigation methods, application of GIS technology in karst hydrogeology, remote sensing methods in geomorphological and hydrogeological researches. Licenses for hydrogeological, speleological and cave diving investigations. International experiences (Turkey, Iran, Algeria, Somalia, Montenegro, Bosnia & Herzegovina) in projects coupled with dam and reservoir construction and maintenance, rehabilitation of Ranney and other type wells, supervision of borehole and well drilling, pumping test execution, tracer tests organization, and 3-D models and database creation. Constructor of hydrogeological field equipment for groundwater monitoring and video-endoscopy (borehole TV logging equipment). Member of the Board on Karst and Speleology of the Serbian Academy of Science and Arts, the Karst Commission of the Serbian Geological Society, and the Serbian Geomorphological Society. Author of more than 50 articles and chapters in prominent karst text-books.