



International Course and Field Seminar
Characterization and Engineering of Karst Aquifers



Provisional program – 2020:

Day	Time (h)	Topic/Activity	Lecturer	
(11 June)	10 AM -	Arrival, Transfer (from Belgrade, Podgorica), Registration		
	7.30 PM -	Welcoming reception		
Day 1 (12 June) Žabljak, Monte- negro	9–9.30AM	Opening ceremony	Z. Stevanović	
	9.30 – 11 AM	Introductory note, program; Historical development of karstology and karst hydrogeology; Importance of karst and karst distribution worldwide; Geo-heritage sites; Dinaric karst		
	11.15 AM – 12.45	Carbonate and non-carbonate rocks: mineralogy, depositional environments, classifications		D. Milovanović
	1.45–3.45 PM	Porosity and permeability of karstic rocks; Karstification process and its features: Surface and subsurface karst landforms; Groundwater circulation in karst: recharge, flow types and directions, discharge		Z. Stevanović
	4 – 6.30 PM	Optional: Tara River canyon - Rafting		
Day 2 (13 June) Žabljak, Monte- negro	9 – 10.30 AM	Methods in karst hydrogeology – an overview; geology, remote sensing, geophysics, water points inventory, groundwater tapping, hydrogeological properties and field tests	Z.Stevanović	
	10.30 – 11.30 AM	Methods in karst hydrogeology – climate, hydrology, statistics (exercise)	V. Ristić Vakanjac	
	11.45 AM – 12.45	Methods in karst hydrogeology – geomorphology, speleology, speleo diving, exploratory drilling, hydrogeology maps, GIS modeling, database	S. Milanović	
	2–3.15 PM	<i>Professional practice:</i> Quality dynamics at karst-springs. A challenge for drinking water supplies. Isotopic methods in karst, GW ageing - examples	Lj Vasić	
	3.15–4.15 PM	<i>Junior expert class:</i> Karst aquifer vulnerability; Anthropogenic impact and hazards; Karst Disturbance Index	B. Petrović	
	4.15-5.15 PM	<i>Junior expert class:</i> Groundwater management and transboundary aquifers in karst: problems and solutions	V. Marinović	
	5.15-5.45 PM	<i>Protecting the nature: “Forgotten species”</i> (movie by S. Milanović) (exercise) and visit of Crno jezero glacial lake		
Day 3 (14 June) Field trip, Žabljak, Nikšić, Virpazar	8 AM - 6 PM	<i>Practical work and field trip:</i> Durmitor Mt: Geological setting, tectonics, karst features, demonstration, training and measurements at Bukovica and Glava Šavnika springs. Nikšić polje – general hydrogeology, dams and reservoirs, combat water losses, engineering solutions; Glava Zete spring and HE PP; Bolje sestre intake for Montenegro coast – welcome by Director Jevrić,	Z. Stevanović and assistants, V. Vlahović, G. Jevrić, Bolje sestre staff	

MNE		general geology, water resources availability in karst	
Day 4 (15 June) Bolje sestre, Virpazar MNE	9 – 11.30 AM	Bolje sestre intake. Problem of tapping karst waters, investigation program, technical solutions. In-the- field test – tracing of piezometer, case study exercise (water treatment, monitoring).	Z. Stevanović MM. Radulović S. Milanović Bolje sestre staff
	11.30-1 PM	Special topic	Guest lecturer
	2.30 - 6 PM	<i>Boat floating and shoreline sites visit.</i> Skadar Lake – general biota and eco system, submerged flows, water balance.	MM Radulović D. Radojević V. Marinović
Day 5 (16 June) Field trip, MNE, B&H	8 AM - 5 PM	<i>Field trip:</i> Travel to Montenegro Coast. Tunnel Sozina, Budva, Kotor - UNESCO Heritage site and its water supply. Fresh-brackish water interface, huge temporary springs and vruljas along Boka Kotorska Bay: Ljuta, Spila, Sopot. Case study exercise, film display; “Stone Sea” – “Angry” karst of Orjen Mt., Grahovsko karst polje; Arrival to Bosnia & Herzegovina, Trebinje.	Z. Stevanović S. Milanović Lj. Vasić
Day 6 (17 June) Trebinje B&H	8.30 – 9.45AM	Characterization of karst aquifers; Groundwater budget; Specific regime of karstic groundwater (quantity, quality); Safe yield; Aquifer control and sustainability	Z. Stevanović
	9.45 - 11.15AM	Water resources cycle in karst; Surface-groundwater interaction; Feasibility and engineering design; Environmental impact assessment; <i>Case studies</i>	O. Bonacci
	11.30 -12.45	Application of stable isotopes in karst hydrogeology	M. Brenčič
	1.30 - 2.30 PM	Modeling of karst aquifer – Springs hydrograph analysis and stochastic models (exercise)	V. Ristić Vakanjac
	2.30 – 3.30 PM	<i>Case study:</i> Leakage from reservoirs, specific research methods and remedial measures	S. Milanović
	3.45 – 4.45 AM	Regional groundwater flow in karst	M. Brenčič
	4.45-5.30 AM	IGRAC Mission: Transboundary aquifers: problems, solutions and experiences	N. Kukurić
	5.45 – 6.45 PM	<i>Work and demonstration in the field:</i> Springs inventory (visit of Lušac spring in Trebinje suburb).	S. Milanović Lj. Vasić HET / FMG staff
Day 7 (18 June) Trebinje B&H	9-10.45 AM	Problems related to construction of dams, reservoirs and other structures in karst; Investigation, design, corrective measures.	P. Milanović
	10.45-2.30 PM	<i>Half-day field trip.</i> Oko spring intake. Grančarevo and Gorica dams. In the field test – tracing of piezometer, sampling, analyses in the Chem. Lab. Case study exercise.	P. Milanović and assistants
	3.30-4.30 PM	Problems related to construction of dams, reservoirs and other structures in karst: case studies	S. Milanović
	4.30-5.00 PM	Presentation on the HE system Trebišnjica; <i>DVD movie “Trebišnjica”</i> . Discussion	
Day 8 (19 June) Trebinje	8.30 AM – 5.30 PM	<i>One-day field trip and seminar</i> (classical karst features, phenomena, engineering structures): Popovo polje – Tučevac cave (training) - Trebišnjica sinking river -Vjetrenica cave – vrelo	guided by P. Milanović

B&H		Bune – Mostar - spring Vrelo Bregave – Dabarsko polje – Fatničko polje (estavelle Obod) - Bilećko Lake (submerged source of Trebišnjica River) – Trebinje	
Day 9 (20 June)		Exam: Written test and verbal discussion for students	
		Results of the exam, Certificates, Closing ceremony. Farewell party: Local winery and restaurant	

B&H- Bosnia & Herzegovina
MNE-Montenegro

Durmitor Mt. photos: <https://karst.iah.org/zorangallery>

Bolje sestre - short movie: <https://www.youtube.com/watch?v=i5SfQZrmQXo>

Coordinator CEKA 2020



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