Report of the Geotrip of the IAH Karst Commission in karst of Romania and Serbia, June 2019

The idea to invite colleagues from all over the world and present wonders of geology and karst landscape and features, but also cultural heritage of the Southern Carpathians and Danube Gorge between Romania and Serbia is proposed by the author of this report during IAH Congress in Dubrovnik, in 2017. It is now a pleasure to announce that geotrip was successfully organized by joint effort of Romanian and Serbian hydrogeologists, between 14-18 June, 2019 with participants of 26 members and friends of the Karst Commission arrived from 11 countries (Albania, Brazil, Bulgaria, Greece, Hungary, Israel, Italy, Russia, Slovakia, Romania and Serbia). In this way an old tradition of the Commission to have such common field trips and workshops was renewed and represents a good starter for the 50 Anniversary of its foundation, which should be celebrated next year during the conference "UNESCO and Karst 2020" (18-22 May 2020, Bowling Green, Kentucky).

On 14 June most of participants arrived to Belgrade, and then a bus transfer to Donji Milanovac, a small city at the Danube reservoir bank, was organized.

Five members of the KC in visit of Jovan Cvijić's museum in Belgrade

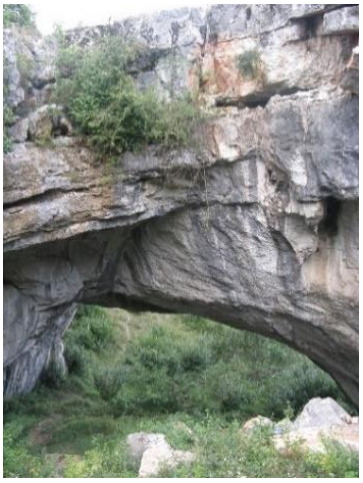
Geotrip area in the Carpathian karst between Danube and Olt Rivers

Djerdap Gorge between Serbia (on the left) and Romania – viewpoint Vidikovac between Donji Milanovac and Tekija)

On June, 15 participants travelled to Romania by crossing the bridge dam of Djerdap (Port de Fer). Meeting with Romanian colleagues and guides Adrian Iurkiewicz, Iulian Popa, Iancu Orașeanu and Marius Mocuta took place in Turnu Severin. The first stop in the Romanian Carpathians (Mehedinţi Plateau) was in Ponoarele village, where several nice and attractive karst features exist: Zaton Lake and ponor, a large karrenfeld, 5 km long Bulba cave system with Peștera Podului, and God's natural bridge. This site "has been longtime a textbook example of karst morphology concentrated in very narrow area".

Ponoarele - explanations by A. Iurkiewicz

Lake Zaton and ponor on its margin



Podului cave (temporary hydrologically active when is discharging Zaton swallow waters, left) and God's natural stone bridge (30m long, 11m high)

The next stop was at Izvarna karst spring, which is supplying potable water to the city of Craiova (115 km faraway, >250,000 citizens). In fact, this is the largest intake of karst spring in entire Carpathian karst, which is solely supplying drinking water to such large city. The discharge of group of ascending springs is very stable, it varies from c. 750 l/s to 2500 l/s. The intake basin and attributed gallery cover some 600m^2. Since 1983 the spring discharge regime and hydrodynamic behavior are affected by construction of the hydro-power system Cerna-Motru-Tismana.

Group of participants in front of the Tismana intake house and an inside view (down)

Monastery Tismana is the oldest one in historical province of Wallachia. It was founded by the monk Nicodim. The building took place during 14th and 15th centuries, while church was originally painted by frescoes in 16th Ct. The nearby cave was a gold treasury during the WW II, but unfortunately cave and museum were inaccessible because of recent flood.

Sohodol Gorge extends over a length of 12 km. At the exit of gorge there is spring Valceaua which along with nearby Jaleş supplying potable water to the city of Tirgu Jiu (>80,000 inhabitants). Their discharge is ranging between 100-700 l/s. Within the Sohodol Gorge there are several nice tunnel-caves diverting the river waters.

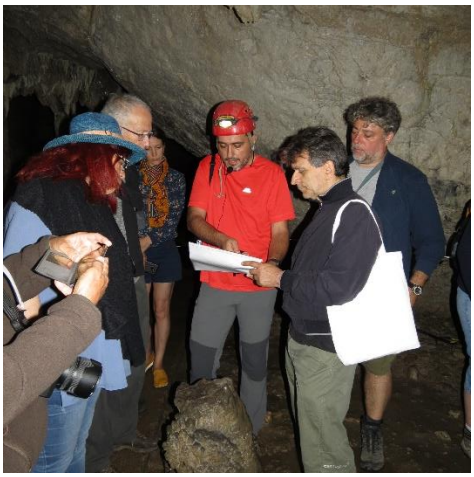
In Sohodol Gorge

Overnight stay was in Tirgu Jiu, the capital of Gorj County. The next morning it was firstly organized visit of monumental complex of “The Heroes Path”. The complex consists of several grand scale sculptures created by famous sculptor Constantin Brancuşi.

Gate of the Kiss (left) and Table of Silence (right) by Brancuşi in Tirgu Jiu's park

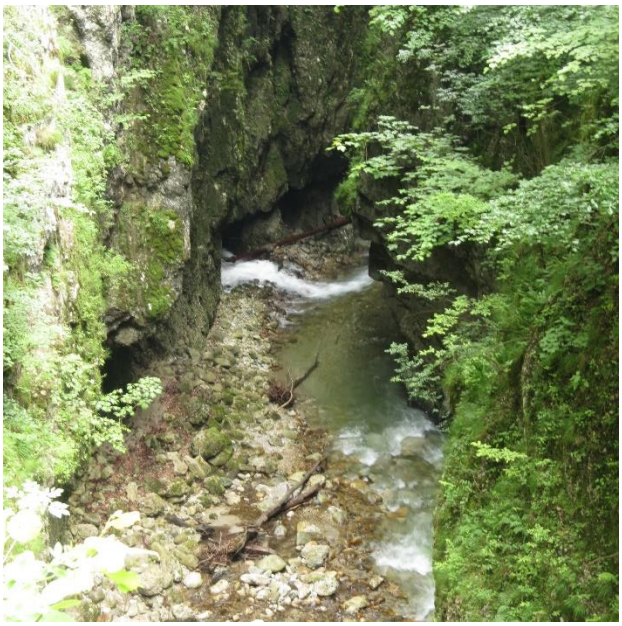
The next visit comprises Galbenul Valley and Muierii (Muierilor) Cave. The cave passages carved in Upper Jurassic - Aptian limestones are explored at some 7000m, while the tourist path is 570m long. It is decorated by nice speleothems and contains rich archeological artefacts including Pleistocene fauna remains and thick guano deposits.

Alexandru Petculescu from the Institute of Speleology "Emil Racoviţa", Bucharest provides information on Muerilor Cave



Polovragi is another show cave visited on 16 June. It is situated in Olteţ Gorge, some 1.2 km from the village and nearby monastery. The cave was extensively explored and mapped, and some 11 km of galleries are currently known. The tourist path is 900m long. The walk through deep Olteţ canyon with steep slope and narrow passage is also attracted all participants.

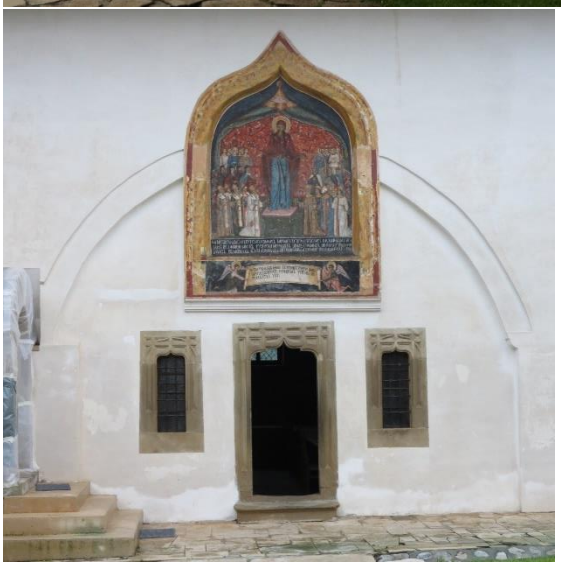





Inside the Polovragi cave (upper photos); Cave stream outlet (down left) and one "heart of karst" high above the left bank of Olteţ

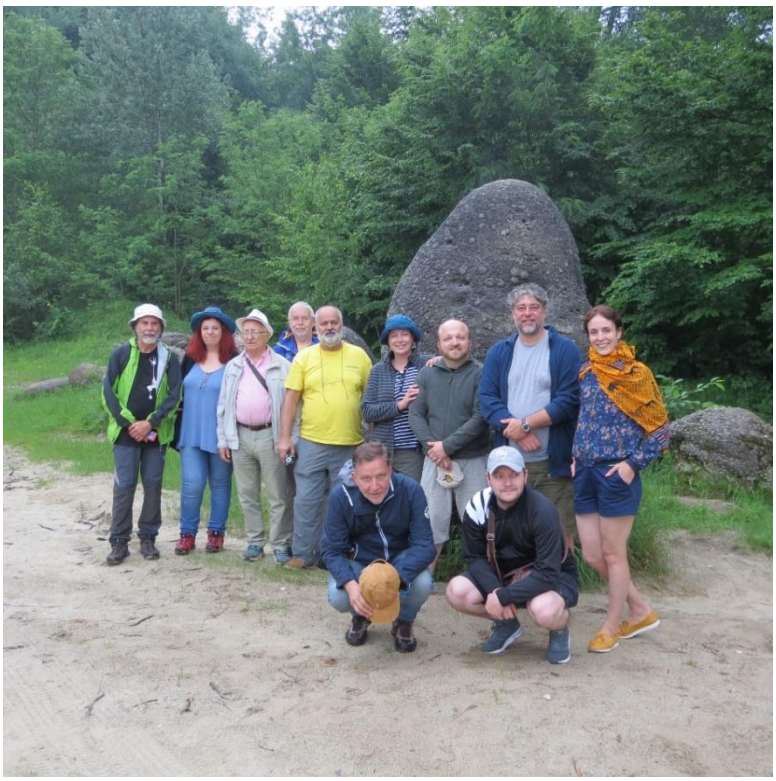
The group then visited Olari village near town of Horezu where unique type of pottery ceramics is traditionally produced. The site is included in the UNESCO Intangible Cultural Heritage List. Each product is made from very specific type of clay and decorated handy by the crafts ladies.

The Horezu Monastery is included in UNESCO World Heritage List. It was founded by the martyr Constantin Brancoveanu at the end of 17th century. All the churches inside monastery complex have been preserved in their original shape and contain original frescoes painted by Greek masters. Several rehabilitation stages took place and enabled to have a full restauration of the complex.



Horezu Monastery – St Constantine and Helena church (upper photo) and details from the walls

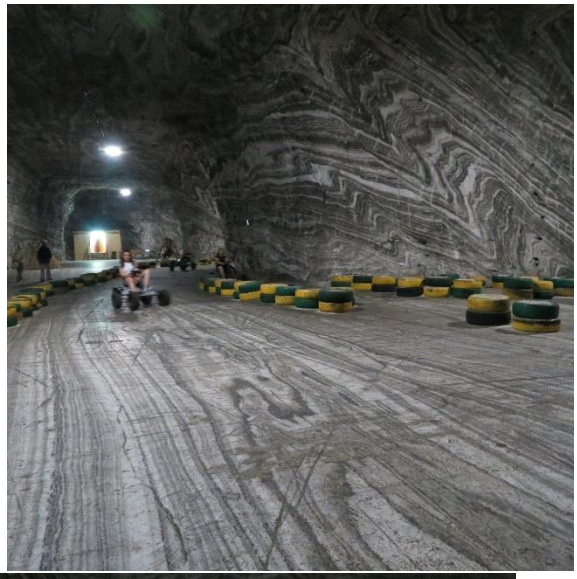
Around 8km from Horezu, near Costesti village is situated Trovants Museum Natural Reserve, also a UNESCO monument. Meaning of *Trovant* is related to large local cemented concretion in a sandy layer. Such very large natural blocks of different shapes and mostly spherical forms are dispersed all along open air "Museum", while some others are still attached to thick sand deposits.



The overnight stay was in Ramnicu Valcea city.

The tour on 17 June, started by visit of one of the largest salt mines in the Carpathians – Ocnele Mari, situated some 8km from Ramnicu Valcea. The salt deposits are of Badenian age (Middle

Miocene), stratified between overlying marls and sandstones, and underlying tuffs. After completing exploitation in one by one horizons downwards they become open for visitors. On around 40,000 m^2 there are many entertainment facilities, restaurants, including museum and chapel.



The lake created in one of the collapses over the salt mine

The next stop was in a large winery Oprişor where owners presented wine making technologies and hosted our participants in their vineyard and cellars. Then after the tour continued to the Serbian border and ended in Donji Milanovac.

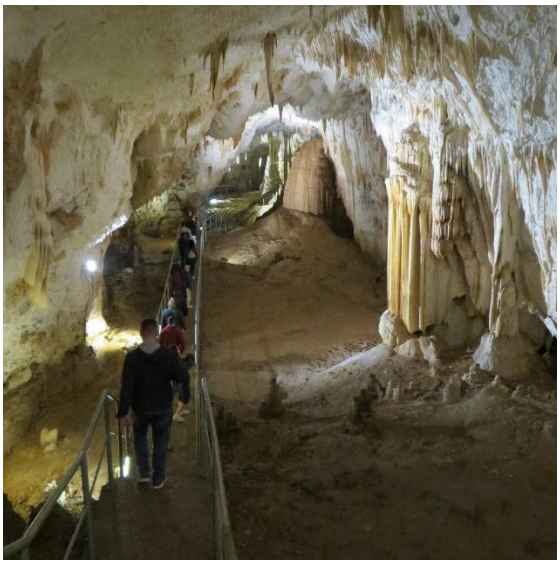
On June, 18 excursion has continued in karst of the Serbian Carpathians. The first stop was in Valja Prerast – natural stone bridge formed in a narrow belt of massive Tithonian/ Valanginian limestones. The passage is only 1.5 m wide, and 37 m high.

Open copper mine field of Majdanpek was next visited site. Copper deposits are formed in andesitic massif of Upper Cretaceous and Paleogene ages. They are mostly of porphyry type mineralization. The main ore zone is relatively narrow, settled between Jurassic limestones and Lower Paleozoic gneisses.

The karst springs of Rajkova and Paskova caves are the two main parallel outlets of karst aquifer of Starica Mt. The surface waters sinking in the small karst uvalas in the upper catchment, percolated and flow through large cavities and finally drain at the caves' orifices. The minimal discharges are around 40 l/s. The connections are proved by several tracing experiments.

Visit of Paskova cave's spring

Rajkova Cave is one of the first caves in Serbia open for visitors. It is firstly explored by Jovan Cvijić in 1894. The total length of the channels is around 2400m. The touristic path is recently extended and well equipped enabling visitors to have direct access and to follow the underground water course.

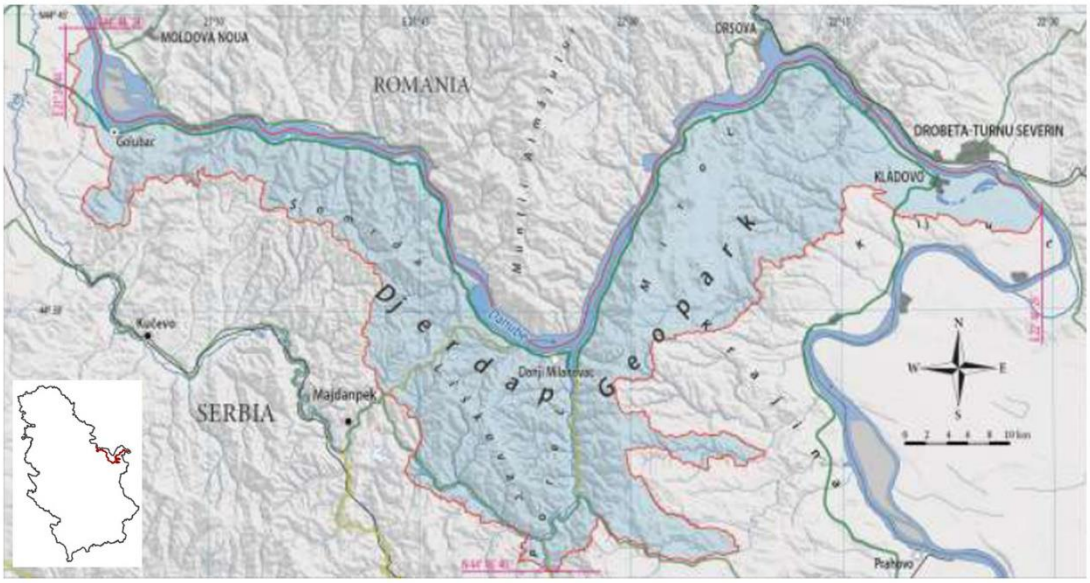


Rajkova Cave

Next visited sites were in Djerdap – UNESCO aspiring geopark. Boljetinska River gorge is the unique sedimentological-paleontological complex that illustrates a part of geological history of the Tethys Ocean during Jurassic-Lower Cretaceous time where also new genera and species of ammonites were identified.

Explanation of conducted activities for Djerdap geopark foundation and stratigraphy of Boljetin paleontological site provided by Aleksandra Maran Stevanović from the Natural History Museum of Belgrade

The last stop for that day was in the Lepenski Vir archeological museum. This site was discovered in 1960s during archeological excavation prior the filling of the Danube Reservoir. The museum contains numerous artefacts and remnants of the specific culture existed from 6800 to 5400 BC and is unique in Europe of the time. Remains have been excavated, under old Neolithic layers, of seven successive communities of the Lepenski Vir culture, separated in three layers.



Location map and boundaries of Djerdap geopark

About 20 additional participants join the Geotrip in Serbia. The last day of trip (18 June) was in the same time pre-conference excursion of the 4th Conference of the IAH Central European Group (CEG) which took place in Donji Milanovac on 19-20 June. Both of these events kept together more than 50 attendants, including almost all Geotrip participants. During CEG several social events was organized, including the boat tour over Djerdap Reservoir and post-conference trip with visits of Golubački Grad medieval fortress and Viminacium Roman city and military campus on Danube limes.

Djerdap visitor center in Donji Milanovac

Dacian last king Dacebal – 43 m high sculpture carved in limestones

Tabula Traiana – memorial plaque in honor of Emperor Traian and Romans victory over Dacian Kingdom (1 Ct. AD)

Golubački grad, recently reconstructed fortress at the Danube River bank.

Excavated Viminacium walls and bones of nearby found mammoth

For this Geotrip the two comprehensive and well-illustrated Field Guide Books were prepared. "Romanian Karst of the Southern Carpathians" (79 pages) has been prepared by Adrian Iurkiewicz and Iulian Popa, and published by the Romanian Association of Hydrogeologists (RAH), while the "Proceedings of the 4th CEG Conference" contains 25 pages of description of the sites visited in Serbia. The latter is posted at the web site of the Centre for Karst Hydrogeology (www.karst.edu.rs) where also in the section *Photo Gallery* some more photos from these events and comments of the participants can be found.

Both Guides can be further use by those want to see and learn more about this attractive natural geological and karst environment. Find and enjoy them!

Report prepared by Zoran Stevanović, Co-Chair of the IAH Karst Commission, supported by Romanian colleagues Adrian Iurkiewicz and Iulian Popa