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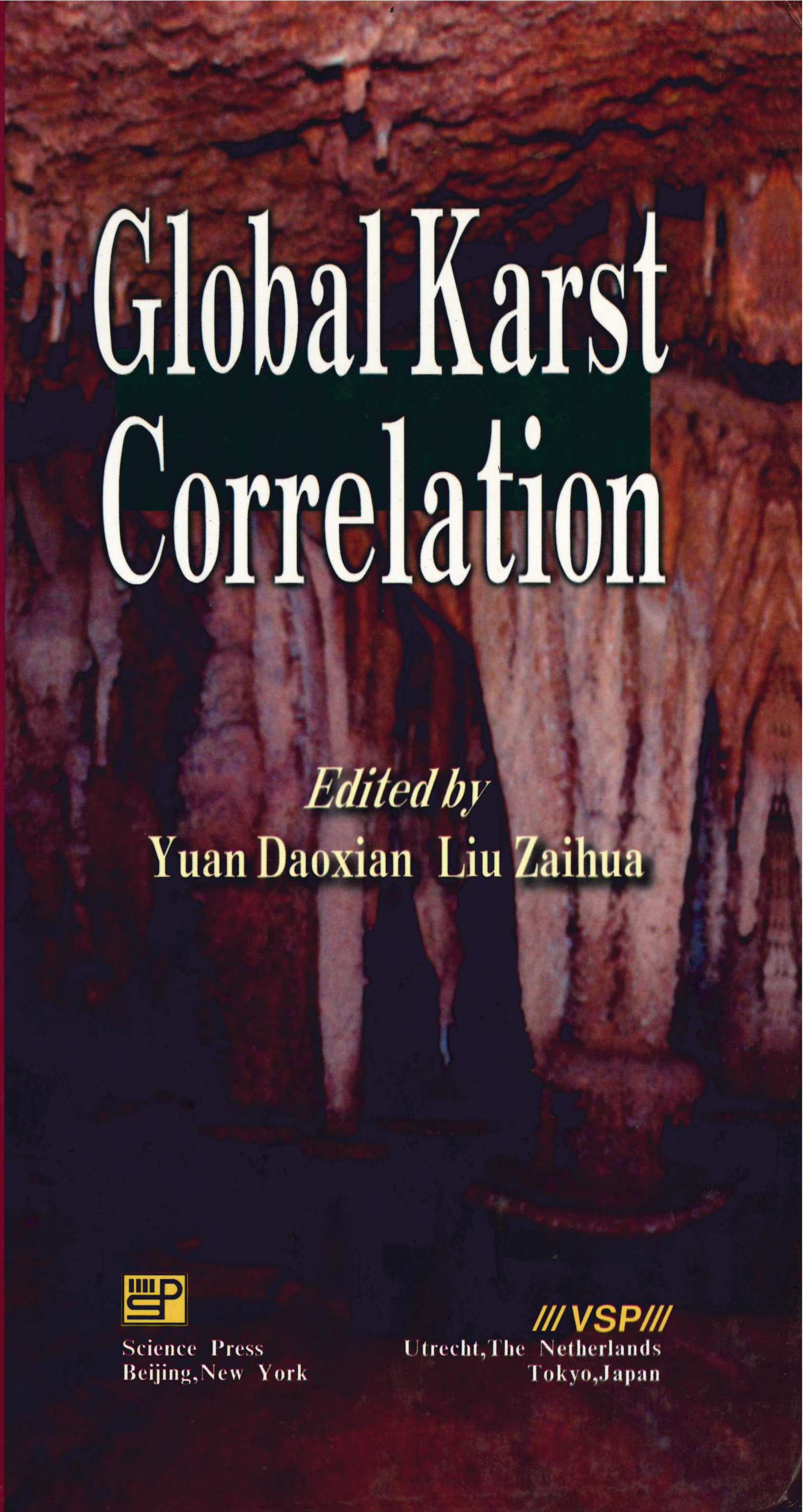

Global Karst Correlation

Edited by

Yuan Daoxian Liu Zaihua

Science Press
Beijing, New York

VSP
Utrecht, The Netherlands
Tokyo, Japan

To Dr. George Ponta

Many thanks for continuous cooperations!

from Yuan Daoxian

袁道先

Gheorghe Ponta
3931 Somerset Pl.
Tuscaloosa, AL 35405-5437

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Final Report

Global Karst Correlation

Edited by
Yuan Daoxian Liu Zaihua
(*Institute of Karst Geology, CAGS, Guilin, China*)

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Chapter 11 Karst of Romania

George Ponta
Bucharest, Romania

11.1 General Data

Romania is situated in the Eastern part of Europe, with an area of 237500 km^2 (91 671 sq. miles), and historically is comprised by four regions: Walachia, Moldavia, Transylvania and Dobrogea (Dobruja).

One third of the territory is occupied by Carpathians Mountains, one third by lowlands hills and plateaus (Transylvanian and Moldavian Plateau) and one third by plains, Romanian (or Danube), Pannonian and Moldavian Plains.

The Eastern Carpathians (Pietros, 2 303 m) and the Southern Carpathians (known as Transylvanian Alps in geographical literature) with the highest point Moldoveanu of 2 544 m cross the country diagonally from north and south meeting in the east center. With the Western Carpathians (Bihor Massif-Curcubata Mare 1,848 m) in the west they enclose the cultivated Transylvanian plateau (300 m to 500 m elevation). The mountains are surrounded north-west, west, south, and east by Pannonian, Romanian and Moldavian plains. The Black Sea coast and Dobrogea are flat. The Danube river cutting through the Southern Carphatians at the Iron gate, forms most of the southern border (Fig. 11-1).

11.2 Climate and Geology

Romania's climate is characteristic to moderate temperate-continental zone, with average annual temperature from 4℃ to 10℃ and mean annual rainfall between 400 – 1200 mm. Average temperature in Bucharest: −2℃ (Jan.), +21℃ (July). Rainfall: 400 mm to 500 mm in Dobrogea, Moldavia and Walachia, 500 mm to 750 mm in the west and central basin, 750 mm to 1 500 mm in the mountains.

In the last 30 years the Romanian karst have been the subject of several classifications based on geomorphological (Bleahu, Sencu, Orghidan and Goran) or geological (Bleahu, Oraseanu) criteria.

Romania's karst can be classified into three categories, characterized by the hydrodynamic conditions of the karst aquifers, i. e., the confined, semi-confined, and unconfined or perched. The difference in the relationship between karst aquifer and landsurface (open karst hydrogeological system or confined) is another major factor to define the three categories.

1. Deep Karst type features occur in the sedimentary rocks underlying non-soluble bedrock and overlain by aquicludes or aquitard deposits (consolidated deposits). These confined aquifers are typical to the Walachian Platform (geological name used for Romanian Plain). The Carbonate Deposits of Malm-Barremian Ages are 1 500 m thick and were encountered by oil wells, thermal water wells and stratigraphic boreholes at a depth of 1 800 m to 2 000 m in the Romanian Plain. Towards south these deposits can be found in the Danube River's bluffs, which constitute the recharge area for the aquifer. The strata dip north with 30°to 40°, in Bucharest area being at 2000 m deep. Due to the

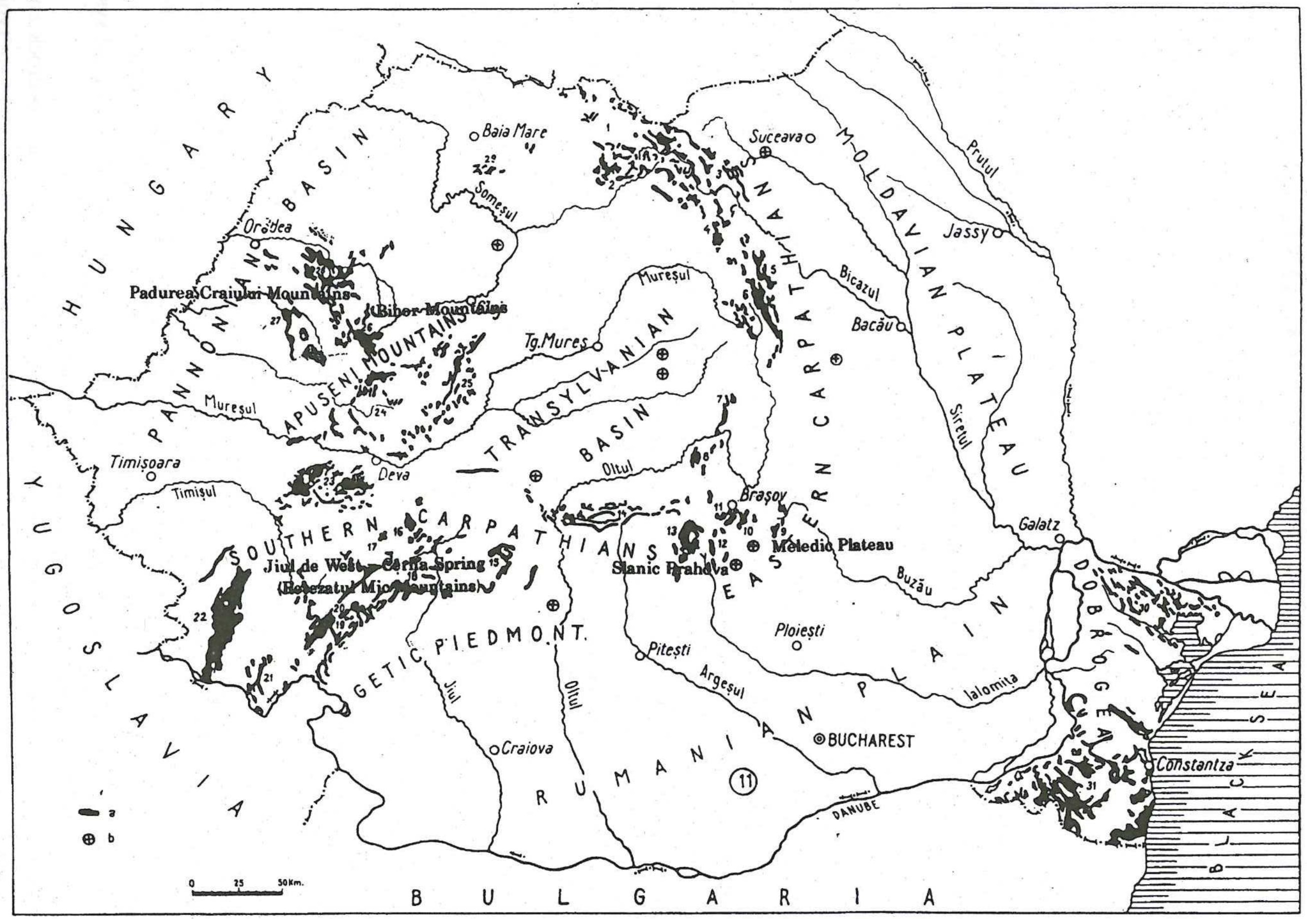


Fig. 11-1 Distribution of karst-forming rocks in Romania (after Bleahu, 1964). a = limestones and dolomites; b = karst developed on salt and gypsum

depth, the karst aquifer's waters are thermalized, their average temperature being +60°C.

In some areas, where the carbonate rocks are close to the oil bearing deposits, the TDS of karst waters are very high (approx. 35000 mg/l). The maximum extension of the deep aquifer is along the Romanian Plain and could cover approx. 25000 km^2. This is the largest karst aquifer in Romania, unfortunately too deep to be utilized at its maximum yield.

2. Shallow Karst type features are in sedimentary rocks overlain by unconsolidated sediments. The thickness of the overburden range between 10 m to 50 m. This type of karst is spread all over Romania, but the greatest extension is known in Dobrogea, where the overburden is formed mainly by loess. The shallow type karst aquifer is mostly semiconfined or unconfined. The average area covered by shallow karst type is approx. 2500 km^2.

3. Bare karst occupies about 4400 km^2 (Bleahu, 1965) or 5000 km^2 (Oraseanu, 1993) on the Romanian territory (approx. 1.4% of the total Romania's surface), and belong to Paleozoic, Mesozoic and Neogene deposits.

The bare karst type features are in the sedimentary rocks on which the karst proper is developed as limestones, dolomites, crystalline limestones, salt and gypsum.

The Paleozoic deposits are recrystallized and represent about 16% of the total bare karst.

The Mesozoic deposits belong to two sedimentary cycles (Triassic – 17.8% and Jurassic-Cretaceous 47.3%), and the Neogene deposits to a third cycle (Eocene, Tortonian and Sarmatian – 16.8%) (Bleahu, 1965).

The most karstified deposits belong to the Jurassic-Cretaceous sedimentary cycle, as a result of their lithological, structural, chemical and hydrogeological characteristics. As a result of this spread, the Southern Carpathians, for example, have the largest bared carbonates regions, but the most karstified are in the Bihor Mountains (Western Carpathians). The characteristic of this type of karst are unconfined, perched and sometime confined aquifers.

From geomorphological and structural (as they have been affected differently by the tectonic movements and have generated specific karstic forms) point of view were proposed three genetic types of karst relief specific to the Romania's territory: 1. Plateau type karst, 2. Ridge type karst, 3. Isolated massive type karst (Bleahu, 1965).

Plateau type karst. It is characterized by large dolomite or limestone plateau with surface karstic features like karren (lapies), dolinen, sinkholes, closed depressions, dry valley and streams with elevation range between 600 m to 2000 m, and covers areas between 20 km^2 and 120 km^2. The thickness of carbonate deposits ranges between 200 m and 600m and alternates with non-carbonate rocks. The most important plateaus are in the Bihor, Sebes or Banat Mountains.

Ridge type karst. The ridges derived from carbonate deposits with thickness approx. 200m dip over 45°. As in the previous case, most of the time, the carbonate rocks alternate with non-soluble rocks. Due to the differentiated erosion processes very prominent limestones-dolomite ridges appear. Their strikes are controlled by longitudinal faults with regional extension and are cut by transverse faults, on which the karst aquifer is opened and emerge to landsurface through springs.

Isolated massifs. This type is an intermediate one between the previous two, being a less extended plateau. In some places the massif is formed by coral reef or sometimes by elements of megabreccia, olistolites, etc.

11.3 Bihor Mountains Karst Area

Situated in the central part of the Western Carphatians, the Bihor Mountains present large karstifiable surfaces. The most representative is the Padis Karstic Plateau (Fig. 11-2).

In the area, the Bihor unit and posttectonic cover formations outcrop with Paleozoic, Mesozo-

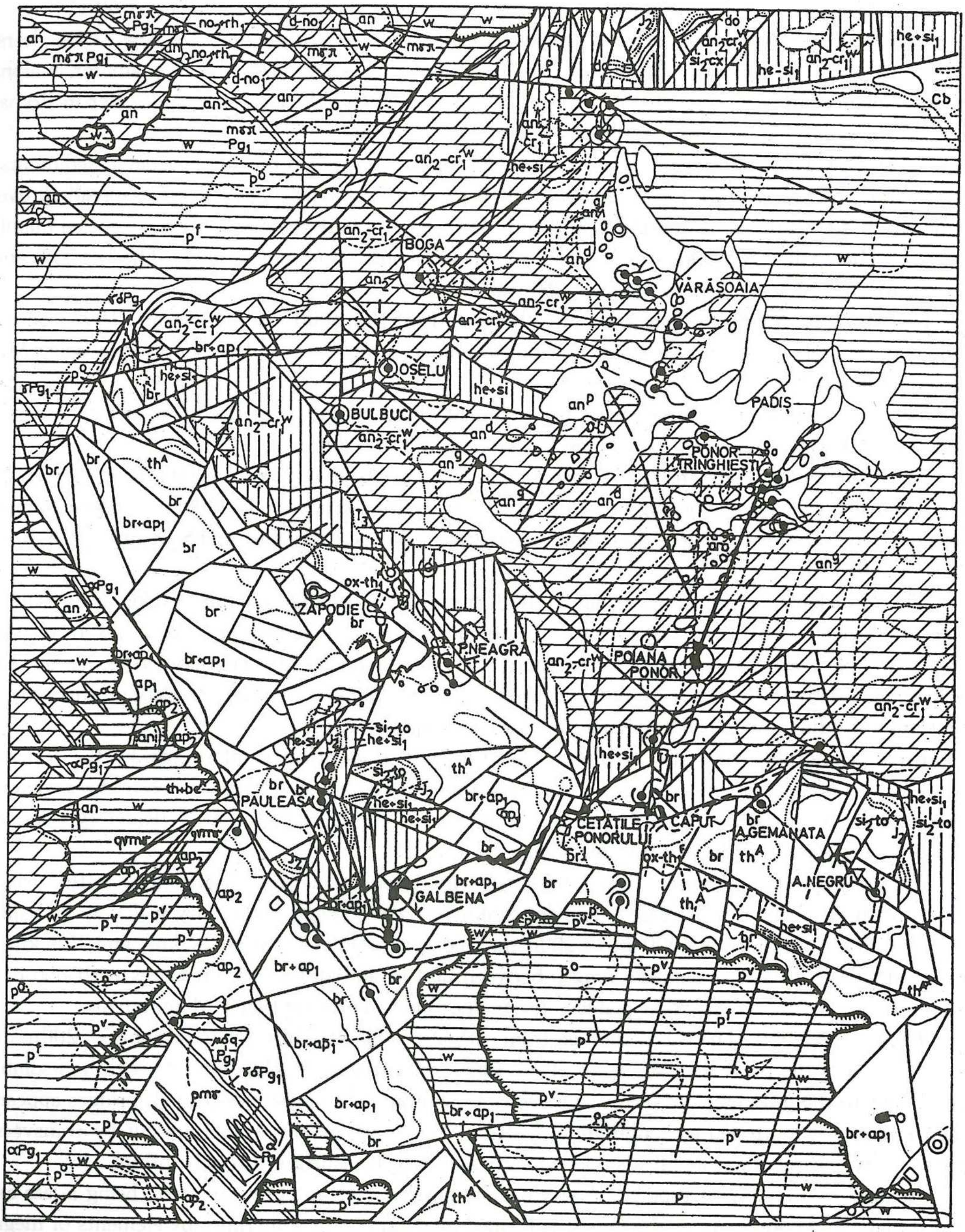
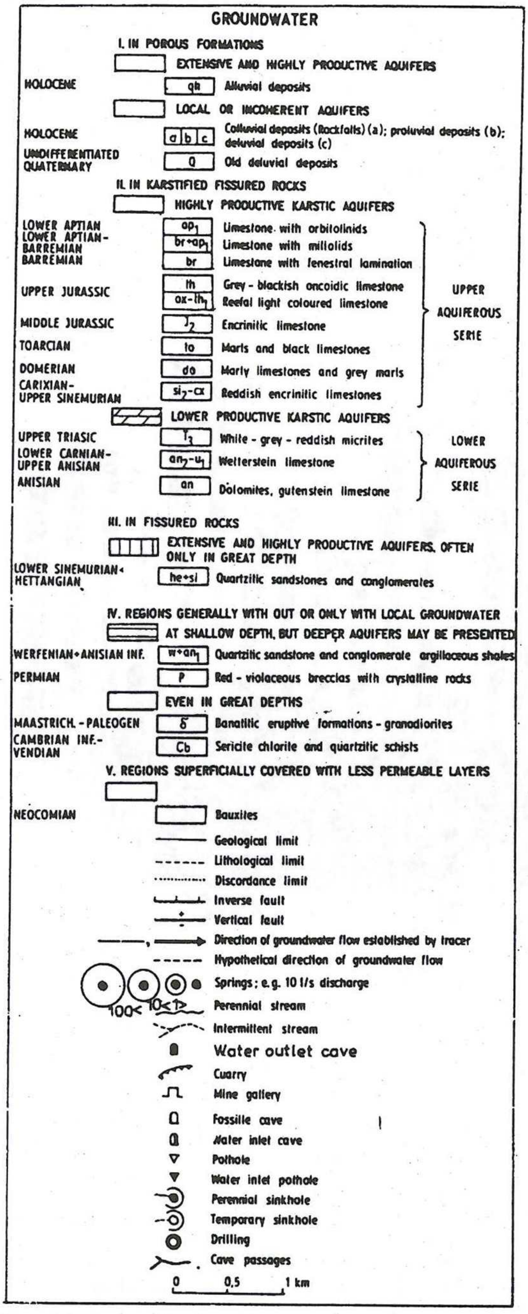


Fig. 11-2 Padis karstic

ic, Tertiary and Quaternary sedimentary formations that have metamorphic rocks in the basement (Mantea, 1985).

In the Mesozoic deposits several Triassic, Jurassic and Cretaceous formations have been separated.

The detrital rocks deposits, which continues with quartzites sandstones and a sequence of silty



Plateau

shales, of Werfenian-Lower Anisian, or Werfenian age (about 70 m thick), associated with Permian deposits or Crystalline formations, form the main impervious rocks at the base of the limestones.

The Middle Triassic Deposits are represented by almost exclusively carbonates deposits, which appear as an alternation of Gutenstein Limestones (whose thickness does not exceed 150 m), dolomites of Anisian age (60 m thick) and Weterstein reef limestones (300 m in thickness). These carbonate deposits form the Lower Aquiferous Series (approx. 500 m thick).

Following the Old Chimeric movements on the whole territory of the Bihor Mts., due to the relief uplift, new sources of detrital sediments appear, dominantly continental.

Detrital Formation (Hettangian-Lower Sinemurian) attains 160 m in thickness and is built up of quartzoses conglomerates, sandstones and shales. These deposits form the impervious deposits between the Triassic and Jurassic limestones, separating the Lower Aquiferous Series from the Upper Aquiferous Series.

Calcareous formation up to 45 m thick, that is considered equivalent of Gresten Limestones (Upper Sinemurian-Carixian age) and the Middle Jurassic deposits occupy reduced areas and are not very thick, being formed by a succession of grey-blackish limestones, shaley (marly) limestones and encrinitic limestones.

The Upper Jurassic formations occupy remarkable areas and are represented exclusively by limestones. The thickness of the Upper Jurassic is generally variable, but not exceed 300 m.

After the Upper Jurassic sedimentation, the new Kimmerian phase, determinates the exposure of the territory and creates favorable conditions for the bauxites ore emplacement (Neocomian age), which are overlain by the Eo-Cretaceous age limestones. All these limestones of Jurassic and Cretaceous form the Upper Aquiferous Series (450 m thick).

The impervious bed between the two aquiferous series, formed by Hettangian-Lower Sinemurian age deposits is known as an aquifuge or some time aquiclude formation. In between two relatively impervious rocks, the Lower Aquiferous Series is like a confined aquifer. The impermeability of the impervious rocks is partially, especially due to the discontinuity of the formation as a result of the fractures which allows an intercommunication between the two aquifers, being preferentially directed from the Triassic to the Jurassic and Cretaceous deposits. Due to this fact, in general the discharge of the springs situated in the Upper Aquiferous Series is higher, being regarded as Highly Productive Karstic Aquifers, while the Lower Aquiferous Series are Lower or Medium Productive Karstic Aquifer.

The waters of the Bihor Mountains karst aquifers are dominated by calcium bicarbonates and the TDS varies with source. Cave streams and karst springs waters are mostly saturated with respect to calcite. Wells waters (installed in non-carbonates deposits) and surface waters (swallets) have higher concentration of sodium chloride and sulfates (Fig. 11-3).

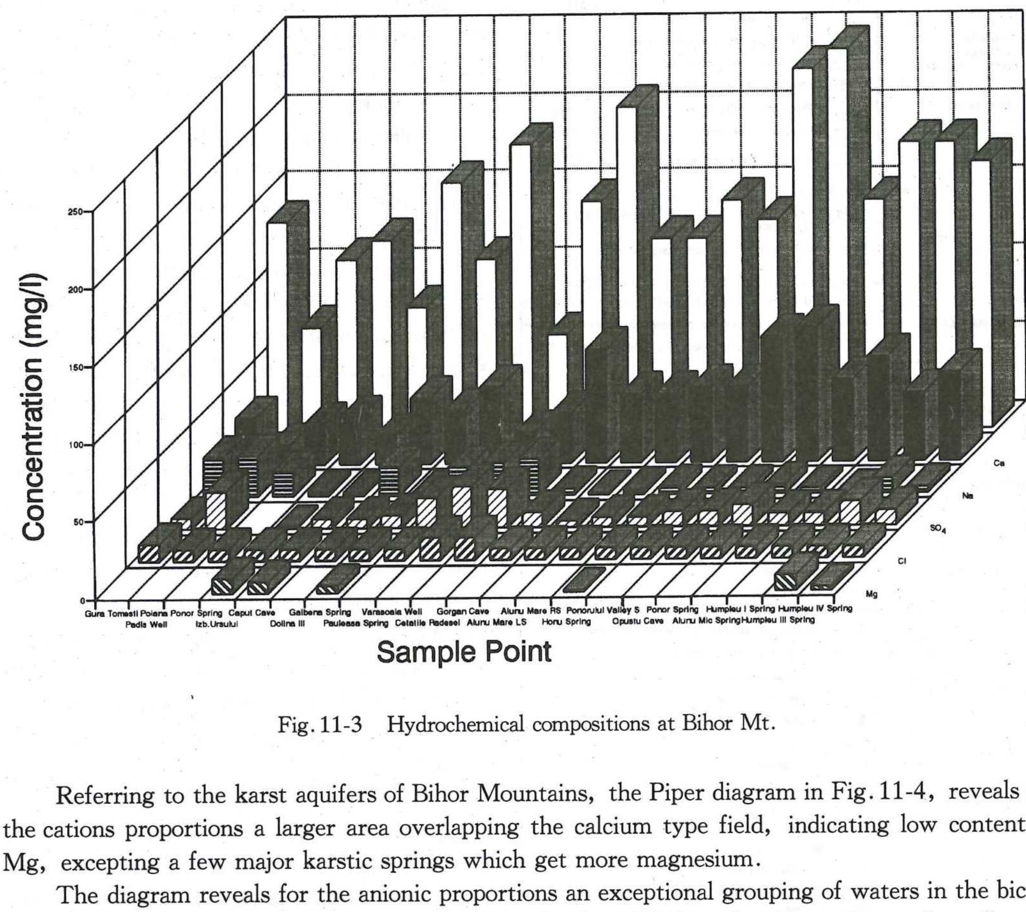


Fig. 11-3 Hydrochemical compositions at Bihor Mt.

Referring to the karst aquifers of Bihor Mountains, the Piper diagram in Fig. 11-4, reveals for the cations proportions a larger area overlapping the calcium type field, indicating low content of Mg, excepting a few major karstic springs which get more magnesium.

The diagram reveals for the anionic proportions an exceptional grouping of waters in the bicarbonate type field. Also a group can be observed in the diamond-shaped cation-anion graph, reflecting that the Bihor Mountains have calcium (magnesium) bicarbonates waters with low TDS.

The environmental isotopic analyses for Bihor Mountains waters showed in the Fig. 11-5 that the waters from the various resources presented above can be arranged in three distinct groups (Tab. 11-1):

Group A: Waters in which the relative Deuterium and ^{18}O content are between 11.12‰ and 1.95‰. This group includes surfaces waters, wells (wells installed in non-carbonate deposits) and springs waters with small recharge areas, over 50% of the discharged being supplied by sinking streams and precipitations.

Tab. 11-1 Environmental isotopes analyses at Bihor Mt., Romania

Sample Point Name	Sample Point Number	Oxygen $\delta^{18}O$	Deuterium δD	$d = \delta D - 8\ \delta^{18}O$
Alunul Mic Spring	1	-10.68	-74.32	11.12
Varasoaia Well	21	-10.80	-78.25	8.15
Padis Well	12	-10.74	-79.64	6.28
Honu Spring	10	-10.67	-79.64	5.72
Galbena Waterfall	15	-10.55	-78.84	5.56
Tringhiesti Swallet	11	-9.77	-74.20	3.96
Ponor Valley Swallet	4	-8.81	-67.52	2.96
Caput Cave(stream inl)	16	-5.92	-44.64	2.72
Cetatile Radesei(swallet)	19	-10.33	-79.44	2.70
Poiana Ponor Spring	134	-10.25	-80.05	1.95
Boga Well	28	-10.08	-79.44	1.20
Humpleu I Spring	9	-9.51	-75.55	0.53
Dolina III (karst window)	18	-8.66	-68.84	0.44
Galbena Spring	141	-9.38	-74.72	0.32
Humpleu IV Spring	8	-9.99	-81.02	-1.10
Ponor Valley Spring	3	-9.46	-77.02	-1.34
Coliboaia Spring	27	-7.98	-65.26	-1.42
Boga Spring	26	-8.26	-67.52	-1.44
Alunu Mare Right Spring	7	-10.03	-83.24	-3.00
Gorgan Cave Spring	5	-7.82	-65.84	-3.28
Alunu Mare Left Spring	6	-10.00	-85.12	-5.12
Pauleasa Spring	20	-8.39	-72.25	-5.13
Oselu Spring	22	-8.05	-70.72	-6.32
Bulbuci Spring	29	-7.71	-68.25	-6.57
Ursului Spring	17	-7.19	-64.26	-6.74

Group B: Waters in which the relative Deuterium and ^{18}O content range between 1.95‰ and -1.44‰. This group includes deep karst aquifers, where more than 20% of the yield comes from surfaces streams and less than 80% are percolation waters and endokarstic condensation waters.

Group C: Waters in which the relative Deuterium and ^{18}O content are between -1.44‰ and -6.74‰. This group includes deep karst aquifers, where less then 20% of the yield comes from surfaces streams and more than 80% are percolation waters and endokarstic condensation waters.

11.4 The Padis-Cetatile Ponorului Karstic Plateau

The Padis-Cetatile Ponorului karstic plateau, with a 54 km^2 of limestone outcrop, is formed by

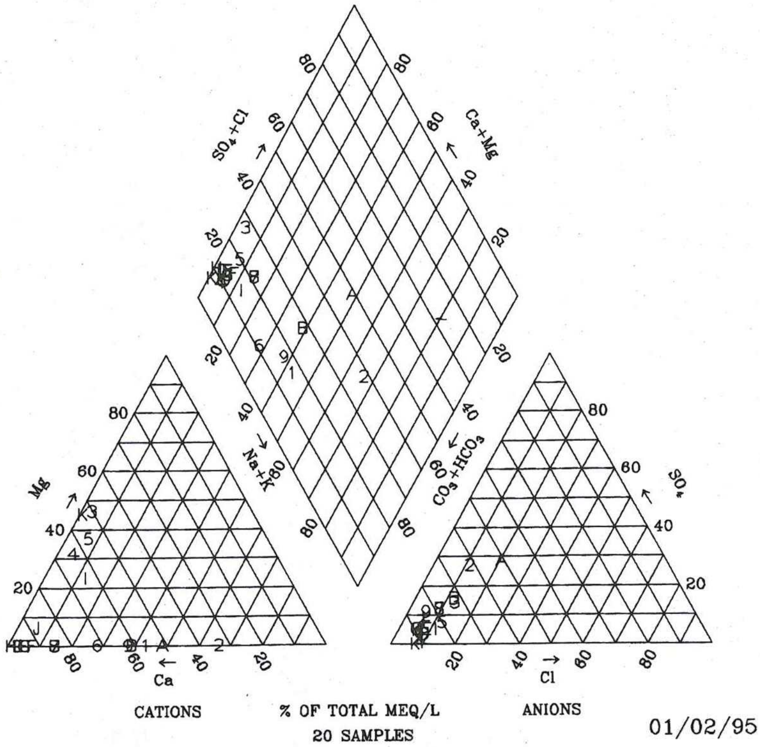


Fig. 11-4 Piper Diagram at Bihor Mt. 1. Gura Tomesti Swallet; 2. Padis Well; 3. Poiana Ponor Spring; 4. Izbucul Ursului-Spring; 5. Caput Cave-stream inlet; 6. Dolina Ⅲ-Karst Window; 7. Galbena Spring; 8. Galbena Waterfall; 9. Pauleasa Spring; A. Varasoaia Well; B. Cetatile Radesei-stream inlet; C. Gorgan Cave-spring; D. Alunu Mare (Left Spring); E. Alunu Mare (Right Spring); F. Ponorului Valley Swallet; G. Alunu Mic Spring; H. Humpleu Ⅰ Spring; I. Humpleu Ⅲ Spring; J. Humpleu IV Spring; K. Somesului Spring

23.5 km^2 Triassic limestones and 30.5 km^2 Jurassic and Cretaceous ones (Fig. 11-2).

In this area 26 stream-sinks and 18 karstic springs have been identified. The main sinking area is situated on Triassic limestones. The watershed in the central part of the plateau established by a sequence of tracing experiments (Oraseanu, 1985) shows the preferential discharge direction to West and South. According to the geological and tectonic map a dispersion of the discharges cannot be observed, the catchment areas being well individualized. The existence of the watershed in that place is determined by the outcrop of the Hettangian-Sinemurian deposits situated at the East side of the Oselu spring and continue under the Quaternary deposits.

The flow path reveals the strong dependence on the tectonic structures.

The Boga spring runs the waters from a 4.5 km^2 catchment area of Triassic limestones. The main stream sinks in Varasoaia, with a total discharge of 60 l/s, the waters being gathered on impervious formations, and will control the high level of Boga spring discharge, which is between 100 – 500 l/s. The same discharges of the streams-sinks can be observed in the Padis-Tringhiesti area (approx. 50 l/s), which were tested with a dye tracing experiment. The tracer appears in the Poiana Ponor spring. This stream after 1 km of subaerial course sinks once again, to be found in the cave of Cetatile Ponorului (karst window) like a subterranean stream, which end in a sump after two km of passages, the waters coming out finally through the Galbena spring. The Poiana Ponor stream-sink is formed along a fault which put in contact the Triassic and Jurassic limestones, being

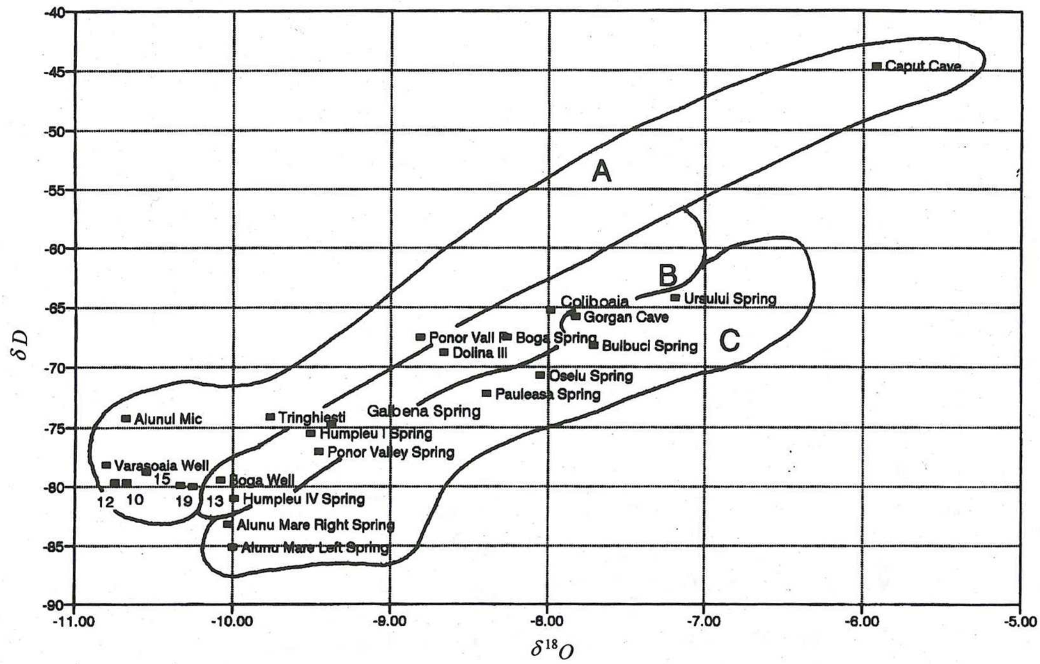


Fig. 11-5 Environmental isotopes ratio at Bihor Mt.

in the same time a connection between the Lower and Upper Aquiferous Series.

On June 18, 1991, 2 kg of Uranine was injected in the Tringhiesti stream-sink. The appearance of the tracer in the Poiana Ponor spring was after 14 hours (Tab. 11-2), the graph presenting 3 pulses of different amplitudes, the storage of the limestone massif being reduced (Fig. 11-6).

Tab. 11-2 Tracing test results

Stream Sink	Alt. (m)	Q (l/s)	Spring Name	Alt. (m)	Q (l/s)	Distance (m)	Difference level (m)	Mean Transit Time (h)	Flow Velocity (m/h)
Tringhiesti	1260	15	Poiana Ponor	1100	134	1980	160	96	20.62
			Galbena	800	228	5350	460	102	71.33

The appearance of the tracer in the Galbena Spring was after 40 hours, the graph being flatter, that shows that the storage condition are different, the vadose flow being shorter.

The flood hydrography of the Poiana Ponor and Galbena Spring, seems to be of a vadose cave stream and tend to be peaked and similar to a surface river (rapid response of large channels and enlargements). The storage is strongly influenced by the proportion of the rainfall input that runs off and the lag between the input event and the output response is very short.

The water quality data shows a relatively low mineralized water of the aquifer reservoir during normal and increasing flow-rates. Once the flood peak is passed, the newly infiltrated water reaches the spring through the karstic fissures and the mineralization increased. Once the main pulse passed, the decreasing of yield is followed by the dilution of mineralization (TDS).

The TDS of the springs waters ranges between 233 mg/l and 285 mg/l, which are very closed to the TDS (219 mg/l) of the stream sink, confirming once again the high speed flow of the underg-

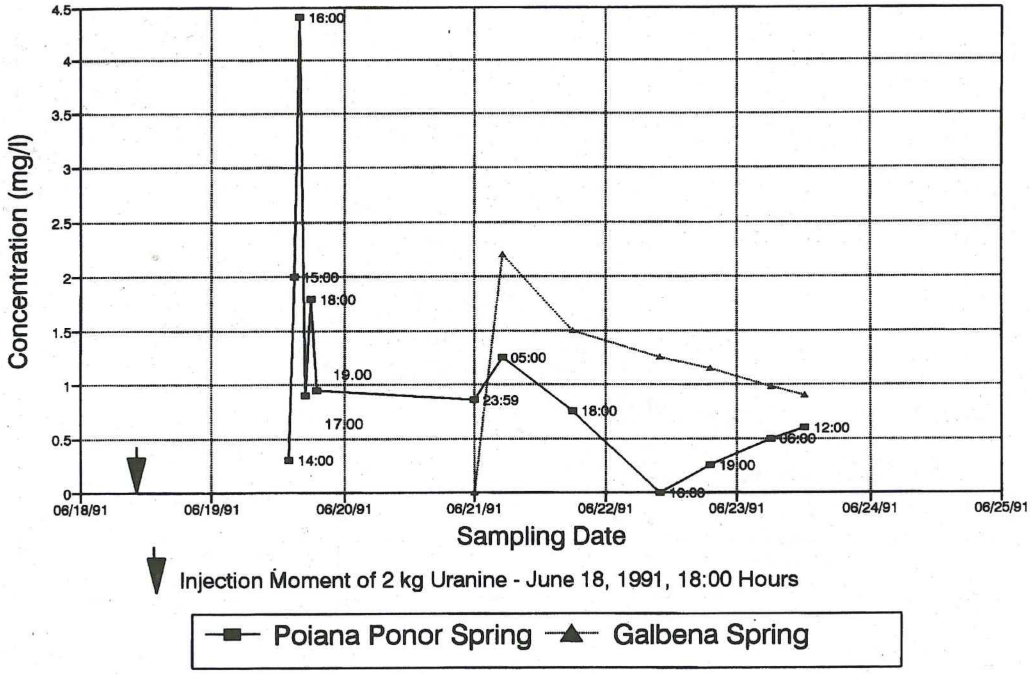


Fig. 11-6 Tringhiesti-Poiana Ponor-Galbena tracing experiment, Bihor Mts.

round stream through the limestones.

11.5 Jiul de West-Cernisoara Karst Area (Retezatul Mic Mountains), Southern Carphatians

Jiul de West and Cernisoara rivers form the natural boundary between the alpine massifs Retezat and Godeanu on one side and Vilcan Mountains on the other side and collect both surface waters and subterranean streams of karst area (Fig. 11-7).

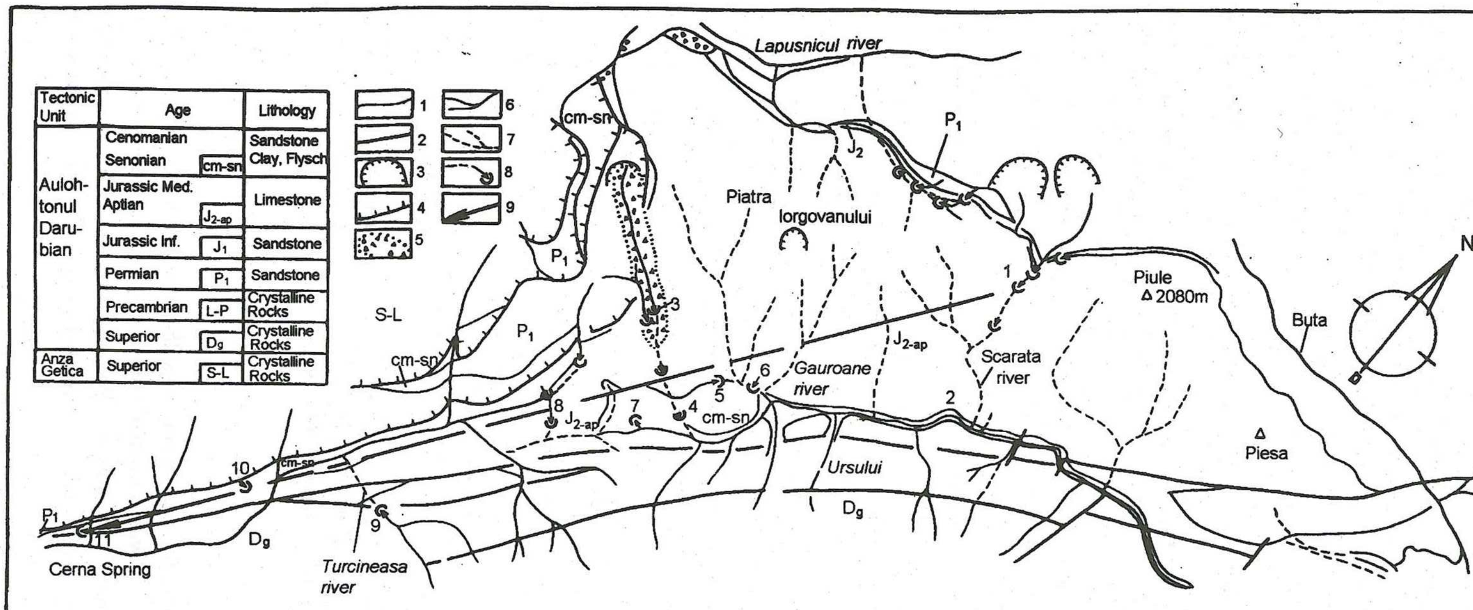
Upstream the confluence of Buta Valley with Jiul de West River, the Jurassic limestones form an upstanding plateau in the Retezatul Mic Mountains (Piatra Iorgovanului-Piule-Plesa), into which an intensive dry valley network were developed.

The right side tributaries of Jiul de West valley collect waters from the Northern slopes of Vilcan Mountains, which are sinking through swallets along the main valley.

The karst area was affected by glaciers which penetrated deeply into the limestones and non-limestones. The glaciers had modeled the Soarbele, Gauroane and Scorota valleys. The first one formed a classic example of moraine behind a Jurassic limestone ridge and the second one present a glacier cirque.

The geological structure of the area includes two major tectonic units: Danubian Autochthonous and Getique Nape. The older basement deposits consisting of crystalline rocks and granites are overlain by Jurassic deposits formed by Liasic sandstones and Middle Jurassic-Aptian limestones and dolomites. These deposits are disposed in a synclinal structure with the southern slopes crossed by a main fault, which constitutes the boundary between the limestones and the crystalline rocks. Along a second fault, parallel with the first one the Jiul de West river flows and presents many active and dry sink-holes.

The limestones are stratified into 15-20 cm thick layers of pale gray to cream color. The bed-



Key:
1. geological boundary; 2. fault; 3. glacier circus;
4. Overthrust boundary; 5. moraine; 6. river;
7. temporary river; 8. swallet; 9. flow direction of subterranean stream established by tracer.

Number on the map	Point's name	Altitude (m)	Discharge (l/s)	Distance to Cerna Spring (m)
1	Scorota Swallet	1390	20	13350
2	Jiu	1100	15	12250
3	Soarbele Swallet	1530	17	8570
4	Soarbele II Swallet	1200	0.2	8480
5	Scocul Mic Swallet	1270	1.5	9250
6	Fundoane Swallet	1200	0.5	9750
7	Lacul Ratii Swallet	1330	0.1	7780
8	Sturu Swallet	1330	10	6800
9	Turcineasa Swallet	940	9	4160
10	Suspendat Swallet	850	2	2240
11	Cerna Spring	700	1300	

Fig. 11-7 Map of Jiul de West-Cernisoara Karst Area

ding plane dips south at 40 to 60 degree. The thickness of carbonates deposits ranges between 1500 m and 2000m in Retezatul Mic Mountain to about 200 m around Cerna Spring.

The Jiul de West-Cernisoara karst area is about 41 km^2 where 10 active stream-sinks have been identified, which flow towards to Cerna Spring. Jiul de West stream-sink was tested by Povara (1974) with uranine, which appeared in the Cerna Spring after 10 – 12 days.

In 1982 the Geological and Geophysical Prospecting Company with I. F. I. N. Bucuresti made a tracing experiment in the Scorota swallet. The stream-sink is situated at 13350 m away and 700 m higher from Cerna Spring.

Scorota inlet is situated at the contact between impermeable crystalline rocks and the Jurassic limestone.

On August 9, 1982, 100 g of In-EDTA were injected in Scorota stream-sink which had 25 l/s discharge. Samples were collected at Cerna Spring and from Jiul de West River, downstream the contact with the non-carbonate deposits.

Samples collected and analyzed showed that the direction of the flow was only to Cerna Spring. The first tracer appearance was encountered after 10 days since injection, and the last one after 38 days since tracer's injection (Fig. 11-8).

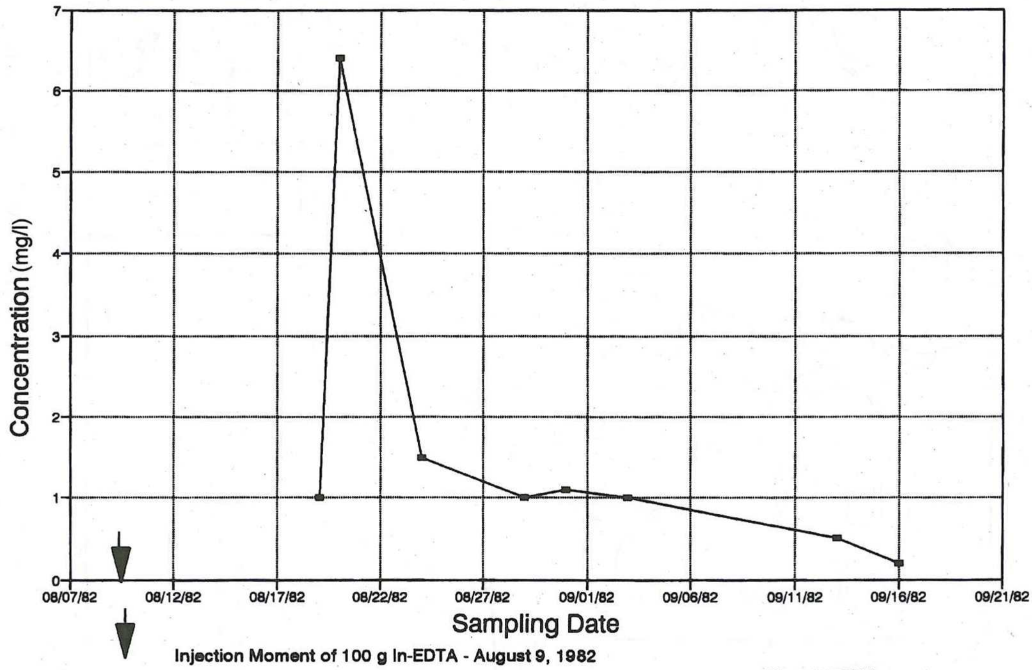


Fig. 11-8 Scorota-Cerna Spring tracing test, Retezatul Mic. Mts.

The travel time of the tracer through Cerna Spring was 28 days. Based on the Cerna Spring's yield measurements done by I. M. H., it was calculated that the tracer recovery ratio was 33.5% and a part of the tracer remained stored in the aquifer. We supposed that a second opening of the aquifer did not exist, and based on the travel time, it seems that most of the flows are through large channels and enlargements (vadose regime).

Based on this tracing experiment the Cerna Spring recharge area includes on its boundaries the Retezatul Mic Mountains.

The Jiul de West-Cernisoara karst area is an excellent example of subterranean stream piracy facilitated by main fault systems and the synclinal structure of limestones. It is a great possibility that a second recharge point of this aquifer to be situated on Buta valley.

Yield measurement of inlet-outlet relationship suggests that under average condition the sink provides about 20% of the outflow water. Study of the catchment characteristics, (especially done on karren areas), suggests that 80% of spring discharge is formed by percolation waters on bare rock and endokarstic condensation waters.

11.6 Evaporites Karst

The karst formed on evaporitic rocks represents 5% of the Romania's bare type karst and is developed on small areas.

Exocarst in gypsum formation is not so widely spread. Some sinkholes occur in the Southern Carphatians, near the Cumpana village area and also some small karren fields.

On the contrary the salt deposits are intensively karstified. The salt outcrops in the lowland hills of Eastern, Southern Carphatians and Transylvannian plateau. Salt karst occurs more frequently than gypsum under the form of the salt rocks in Miocene formations. These massifs sometime outcrop in the Eastern and Southern SubCarphatians Hills.

In most areas the salt deposits are overlain by unkarstifiable rocks, on which karstic forms appear due to the salt dissolving processes.

In the area of Slanic Prahova is a large salt massive, along the axis of Slanic syncline.

During the 18th century the exploitation of salts started. At Baia Baicului two salt mines were dug. Due to the work on vertical system, from lowers part to upper one, the results were two bell shape mine, which had only an ephemeral existence being inundated by waters. The salt dissolved produced the collapse of the ceiling in one of the mine. Now a salt lake is in that place, used as a spa. Due to the collapse a land slide was produced on the slopes of the second mine, the results being an isolated mountain. Beginning with that moment, the salt mountain slopes were exposed to dissolution and precipitation processes and typical forms as microkarren, karren and cave corals on the outside walls were formed and the collapse of the ceiling in the mine was produced, which now looks like the opening of a large pothole. The mine was inundated by waters and form a 20 m deep salt lake. The name of the mine is Grota Miresei (Bleahu et al., 1976).

Salt outcrops in several places in the Slanicul de Buzau basin (Eastern Carpathians). The largest zone is Sareni-Trestioara situated between Slanic Valley, Sarii Valley and Meledic Valley. It is known under the name of Meledic plateau.

The average altitude of the area is 600 m. It has a lowland parts with deep valleys and steep slopes affected by land-slides and streams.

The karstic pattern are represented by precipitation and dissolving forms which can be found on salt adjacent formation too.

Karren are often met on salt karst. They are 0.01 to 3 m long and are 2 – 8 cm deep, having short ridges between them. Their size depends on salt quality. It is obvious in the case of the salt mountain from Slanic Prahova that in the zones where the salt is dark colored karren completely disappears. In the area where the slopes present shelters, cave corrals and salt stalactites are formed.

Sinkholes are formed on salts outcrops or where are covered by thin unconsolidated deposits. The largest forms are situated in salt exclusively.

The sinkholes are 50 m in diameters and some of them attain 30 m in depth. Between the sinkholes are thin sinuous ridges, the areas having a chaotic aspect. At the bottom of the sinkholes impermeabilized with clay, small lakes are formed (max. 0.7 ha). Sometime two or three dolinen fuses, forming uvala.

When sinkholes are situated on a tectonic alignments, dolinen valleys are generated.

Due to the rapidity of the dissolution processes, these dolinen valleys becomes real valleys with a longitudinal profile. In the early stages the drainage is reduced to an underground flows, which passes later to a surface flow. Due to the limited extension of the salt and gypsum, 31 caves are situated in salt and 5 in gypsum, distributed as bellow:

Mountain	Salt	Gypsum
South Volcanic Mountains	1	–
Vrancea Mountains	–	1
Vrancea SubCarphatians	27	1
Buzau SubCarphatians	3	3
Teleajen SubCarphatians	–	–
Total	31	5

The five caves developed in gypsum are situated in Eastern Carpathians and have 10 to 12 m length and 1.2 – 10.5 m in vertical development. The size of the caves are extremely reduced and controlled by the discontinuity of gypsum formations which mostly alternate with non-soluble rocks.

Most of the salt caves are situated in the Meledic plateau (Sareni-Trestioara Zone) where 27 salt caves are known with a cumulated length of 2169 m and a total vertical development of 300 m.

The longest cave of the area is the cave known under the name "6S from Minzalesti", which is situated in the north part of the plateau. The cave's opening is situated at the bottom of a sink hole where another three caves openings were identified. A narrow passage with a few steps, a temporary water inlet, is towards to the main stream passage of the cave. The cave is 1221 m in length and – 32 m in depth and developed on three levels. The lower one is completely active and the other two are fossilized. The connections between the levels are made through chambers, pits and chimneys.

The passages are generally 1 to 4 m wide and 1.5 m to 5 m high. The maximum vertical extension of the cave (– 32 m) is developed along the underground stream passage. The end of the cave is situated just 80 m from the Meledic Creek, at the same elevation with the river. The horizontal extension of the system at this place is 244 m.

The most usual forms in salt caves are stalactites of tubular or conical shape, with or without central opened channel. Their length is 60 cm in maximum and 8 cm in diameter.

Anemolites often attain 50cm to 100 cm in length and about 2 cm in width and are grown in all directions. Their position in space doesn't seem to be related only to the presence of an air current flow with a constant direction, but also to some turbulent currents.

There are also anemolites, 40 cm in length composed by salt crystals, which are growing in rectangle angles. The longest one has 2 m in length and 20 cm in diameter (Giurgiu et al., 1980). All these types of stalactites appear in different colors, from immaculate white to pink, bright red, grey, yellowish-brown and brown.

Stalagmites are not so often met as stalactites. They have a few tens of centimeters in height and 10 cm in width. Generally, the exterior cover of the formations are composed by little crystals.

Also there are a few parietal flows and sometime occurred salt crusts, isolated excentrites and salt powder as well.

Where water drips intensively, a salt crust occurs on the floor as a crystal carpet.

The yield of the creeks which pass the salt deposits are low. On both benches of the creek salt crust are formed, till 10 m long and 1 to 3 m wide. At the bottom of large sink holes waters flow was noticed, generally with low yield, which is going underground through a swallet.

Eight of the Meledic plateau caves are water inlets, four of which having these function just during raining period. The other two caves have an underground stream.

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