3.13.6. TRASCĂU MOUNTAINS

6.1. Orohydrography of the Trascău Mountains

In the sub-divisions described by various authors for Metaliferi Mountains, there is a common understanding, that is about Trascău Moutains. They cover Ciumerna-Bedeleu crest and areas to East of that, up to the Transylvanian Basin.

The Trascău Mountains are directed to NE-SW and are assembled in a well composed morphological unit given the high altitude of the main crest, sensibly higher than the adjacent areas. This crest, of 43 km, covers the Valley of Arieş, in between Buru and Lunca Meteşului streams. Its wide is seldom over 2 km, the extremes being somewhere in between 3-4 km in the perimeter of Bedeleu peak and Ciumerna; and only a couple of dozens to NE of Striglău peak where Ouălelor stream and another flow of Găldiţa stream are in a constant fight of expanding the hydrographic watershed (Fig. 6.1).

The crest of Trascău Mountains is split by two water streams, Râmeţ and Galda, in three segments of varied size:

- the Northern section, in between Arieş river and Râmeţ stream, 25 km long, with rounded peaks and altitudes in between 1,200 and 1,300 m, separated by dolines, remnants of old epigenous streams placed at high altitudes. The Northern part of this sector is split in two, following a deep intrusion of Ordaşu brook (tributary of Arieş river at Vidolm) in the mountains, continued into the South by Boierişte depression in the high area of Muntelui brook. The area is intensely marked by the strong relief of crystalline limestones, to the East of Colţul Trascăului, of a maximum altitude at Ardeşcheia peak (1,249.8 m) and to the West of Iaru, dominated by Colţu Roşu (1,244.3 m), well known for the Larice (*Larix decidua carpatica*) nature reserve it hosts;
- the middle section, in between Remeţi and Galda, bordered to North and South by massive canyon of the two water flows, shaped in limestones and in keratophyres. It is just over 1,100 m and morphologically marked by two major karstic plateaus, Muntele Tecşeştilor to the North and Muntele Ceţii to the South, separated by the transversal section of Aldei valley. The relief of plateaus is mixed with lots of dolines and largely curved peaks ("dâlme");
- the Southern section of the main crest, also shaped in limestones and keratophyres, is narrower than the above-mentioned ones; it has a clear asymmetry of its slopes, the Western one being quite abrupt on its length in between Întregalde and Necrileşti. The key morphological element of that section is Ciumerna platform, a wide levelled surface at 1,200-1,300 m.

Ciumerna plateau is slightly curved, in a compound of dolines and curved peaks. The outcrop surface of limestones is strongly affected by dissolution, while the presence of keratophyres and the Vraconian-Cenomanian sandstones allowed local aquifer accumulations generating superficial small-scale brooks, taken into the underground once they meet carbonated land.

The South-Eastern shape of the plateau is clearly marked by the regressive erosion of three old streams, currently dry ones (Ponoru, Pleşanu and Striglău), meeting each other at Vârtopul Iezerului, a karstic lake, also known as Tăul Ighiel.

To the South-West of Ciumerna, on the same direction of the main crest of Trascău Mountains, the carbonated deposits appear in Feneşului watersed, where the relief suddenly drops by 500 m, leading to one of the most spectacular canyon-like areas of the massive.

Morpho-sculpturally speaking, the crest of Trascău Mountains is a surface of erosion, peneplain-like, under the platform of Fărcaşa-Cârligaţi, an idea suggested by EMM. de MARTONE (1922) and proved by pedological and chemical analyses undertaken by GH. POP and M. NEMEŞ (1959). This area of erosion was named Ciumerna-Bedeleu by ION POPESCU ARGEŞEL (1977), the author proving the presence of other two types of erosion

known in Apuseni Mountains, that is Râmeţi-Ponor area and the Pliocene area, also named in other parts of Apuseni Mărieşel plateau or Arieşu platform by EMM.DE MARTONE (1922). R. FICHEAUX (1929), calls the Pliocene area "a platform of Ţara Moţilor".

Peaks Pleaşa and Piatra Ceţii, all shaped by the same range of limestones, in between 1,150 and 1,250 m high, have massive shapes, rounded or pointed, ended in abrupt ones. In Piatra Ceţii, the landscape is complemented by limestone towers and interstices of sediments surrounding the massive, going up unevenly on structural valleys.

Numerous limestone massives, klippe in the mass of the Cretacic flysh, are placed on a parallel alignment with the main crest, in the East, at an average distance of about 5 km from the crest (Piatra Bulzii, Piatra Craivei, Dealul Stânii, Piatra Grohotişului, Padiş peak etc.).

To the North-East, Trascăului depression borders Trascău Mountains. It is oval, 11 km long and 4 km wide, being bordered to the East by Piatra Secuiului (Colţii Trascăului), and by abrupt areas on the alignment of Colţul Trascăului-Cornul peak. To the North and to the South it is encircled by narrow defiles, cut in limestones by Trascău stream, a tributary of Arieş and Vălişoara, a tributary of Aiud. The maximum altitude of the depression is 555 m in the inter-water areas of the two streams, while the relief goes down with 500-650 m under the surrounding mountains. In the depression, there are several locations such as Râmetea, Colţeşti, Izvoarele and Vălişoara.

Piatra Secuiului is the most Eastern limestones outcrop in Trascău Mountains. Their higher area is shaped as a horizontally eroded surface, a plateau-like one, sculpted in limestones and ophiolites, part of the Ciumerna-Bedeleu erosion surface. The relief of the plateau is sprinkled with eroded shapes whose display was influenced by two cracking systems facilitating the corrosive action of rainfalls. The systems are directed $N55^{C}W/85^{C}SW$ and $N50^{C}$ E/ 100^{C}, and their presence is easily remarked in the micro-relief of the plateau by the alignment of ditches separating the block of limestones.

Overall, Piatra Secuiului are one of the most spectacular landscapes in Apuseni Mountains. It has the most obvious action of exogenous factors generating a ruine-like shaping, mostly predominant in periglacial era, sprinkled with sediments combined with glacis, colluvial deposits, periglacial crests and nival grooves. Some cave entrances and sections of galleries, long fossilized, add to the landscape of the massive.

The hydrological network of Trascău Mountains is totally depending on Mureş river, both in waters collected on the Eastern side through Valea Aiudului, Gârbova, Râmeţ and Galda streams, and its tributaries, Cetea, Cricov and Craiva, as well as via two potential tributaries, Arieşu and Ampoiu, rivers encircling the mountains to the North and the South.

The first tributary of Arieş in Trascău Mountains is Valea Morilor (Uncăşeştilor Valley, Valea Ascunsă). It flows in Arieş at Sălciua de Jos once it collects the streams on the Western side of the North sector of the massive, mostly provided by the Vânătara-Huda lui Papară karstic system.

Vânătara depression, of 44 km^2, is one of the most expanded internal drainage area in Trascău Mountains. It is drained by three superficial streams (Poienii, Caselor and Valea Seacă) meeting each other at the edge of a vertical wall, 50 m high. The ponor altitude at Vânătara is 650 m, being 146 m under the height of the watershed with the basin of the Morilor Valley (Crucea de sub Bulzi, 796 m). After an underground passage of 1,600 m (1 straight km) in Huda lui Papară cave, the water infiltrated at Vânătara reemerges at the surface in the Sub Piatră hamlet in an impressive portal, 40 m high, dug in the abrupt of Bedeleu, where it flows further to Arieş on a 1.5 km with lots of falls and canyons on the way.

Râmeţ stream springs on cretaceous land, at West to the crest of Trascău Mountains. The names of the valley are often changed, from one place to the other, being known as valea Barnii, Valea Mogoşului, Valea Mânăstirii, Geoagiu, Stremuţul or Teiuşul. Alongside Galda, it is the only stream managing to encircle the barrier of limestones and ophiolites in Trascău, both streams being a canyon section of special wilderness and beauty.

Before entering the Cheile Râmeţului, the stream gets in the limestones area two major tributaries, fed by springs on the Western side of Trascău, Cheia stream on the left side and Pravu on the rights side, both having canyon-like sections, falls and whirlpools adding to the touristic value of Râmeţ stream.

To the North of Arieş, tithonic berrisian limestones of Trascău Mountains go up to Turda in a narrow path, of maximum 2 km, transversally intersected by Hăşdate stream at Cheile Turzii.

Trascău Mountains are one of the carbonate massives with the highest number of canyons in Apuseni Mountains, not so much because of the extension of limestones, much more spread in other mountain areas, but rather due to the relationship between the geological structure and the hydrographic system.

The geologic base of the hydrogeological map (Figure 6.1) is draw according to the works of BALINTONI I., LUPU M., IANCU VIORICA (1987), ILIE M. (1936), ILIE M. (1950), BORDEA S., BORDEA JOSEFINA, PURICEL R. (1965), BORCOŞ M., BERBELEAC I., BORDEA S., BORDEA JOSEFINA, MANTEA GH., BOŞTINESCU S. (1981)

6.2. Hydrogeology of carbonate deposits in Trascău Mountains

Limestones outcrop in Trascău Mountains on a surface of 87 Km^2, out of which crystalline limestones is on 19.2 Km^2. Sedimentary limestones is on about 67.8 Km^2, presented as it follows: the main crest, Ciumerna-Bedeleu – 55.5km^2, the secondary crest of Pleşa-Cetii peak – 4 km^2, the area Hopaji-Pravu stream – 2.7 km^2, Piatra Secuiului – 2.5 km^2, Dâmbău Mountain – 1.7 km^2 and Corabia Mountain – 1.4 km^2.

Aquifer accumulation in carbonate deposits are practically fed mainly by rainfalls, the contribution of superficial streams in this process being not significant. Systematic measurements of water flow on Râmeţ and Galda, upstream and downstream to the limestone area of the main crest of Trascău Mountains have not pointed the presence of a supply-drainage relation in between these superficial streams and the aquifer accumulation in the limestones.

Intense tectonic and morphological limestones fragmentation in Trascău Mountains is hydrologically reflected by lots of karstic systems, of limited expansion, which are feeding low discharge springs. The contour of the limestones path in the main crest of Ciumerna-Bedeleu is filled with a series of springs, their mapping unmistakably marking the expanding of limestones in areas covered by diluvia.

Most of the springs are of lithologic boundary type given by the high elevation of limestones to the surrounding valleys. The springs come up on mountain sides and are often placed high above the level of erosion. This observation is valid for all major water supplies on the Western side of the main crest.

The springs on the Eastern side of the main limestones path in Trascău Mountains are at higher altitude than those on the opposite side of the mountain due to the placement of limestones-keratophyres contact at high elevation, sometimes on the peak itself. For this reason, they have lower debits, the watershed line of the underground waters in limestones being moved to the East. Karstic gravitational type sources appear at the local level of erosion and are characteristic for the bottom of the Western mountain side of Colţii Trascăului.

	Source	Q, l/s			n_v	B_f	α	v inf / Vo, %	Corelation and spectral analysis		
		mean	min	max					ME	TF	RT
1	Huda lui Papară	233	50	3960	79.2	0.32	0.029	10	7	0.104	5.6
2	Iezerului spring	96	12	545	45.4	0.14	0.0255	0.5	38	0.072	35
3	Morilor spring	25	16	42	2.62	0.64			19	0.144	19
4	Fântânele spring	10	5	16	3.2	0.5			88	0.152	64
5	Izvorul de sub Piatră spring	3	1	7	7	0.33			85	0.152	60

n_v, index of discharge variability; B_f, base flow index; α, recession coefficient; v inf, volume evacuated from aquifer in falling period; V0, total volume, (V0 = Vdyn+v inf); ME, memory effect; TF, truncation frequency; RT, regulation time.

Table 6.1. Characteristic discharges of the springs and results of the recession and the corelation and spectral analysis.

Water supplies with debits over 5 l/s are further described. Their debits have been evaluated by taking over data provided by hydrometric observation and measurements or only based on measurements undertaken in expeditions. The hydrometric activity was carried out during X.1989-1X.1990. Distinctive debits of those supplies, as well as the results of processing temporal series of debits through various methods are presented in Tables 6.1.

6.2.1. Springs on the Western side of Trascău Mountains

The Valea Morilor Spring (Fig. 6.1 no.7). In the area of Lunca Arieşului, under the North-Western ending of the main crest of Trascău Mountains peak, in between peaks Iarul and Cireşul, there is a karstic spring marked by a horizontal platform, grassrooted, made in the limestone tuffs, deposited by the spring. The spring debit was constantly monitored for a hydrological year, the average being of 25.8 l/s with some variation in between 16 and 42 l/s. the spring was noticed for the lowest index of variability and the highest value of index of base flow for all the supplies monitored in this karstic area. The water is never unclear, and the name is given by the old mills along the valley, upstream its junction with Arieş.

Şipote Spring (Fig. 6.1 nr.10), is placed at the basis of the Western side of Bedeleu peak, at 660 m, with about 235 m over Arieş river. Massive deposits of travertine led to a horizontal, wide platform, from where the water falls into a succession of waterfalls, the last one being at the junction with Arieş. The average debit of the spring is about 30 l/s. Over Şipote spring, on the karstic plateau of Bedeleu Mountain, there are several springs in diluvial deposits, covering keratophyres, with low debits (under 1 l/s) and feeding permanent water supplies or diffusely infiltrating in ponors, places in dolines, some of them hosting temporary lakes.

Huda lui Papară. Huda lui Papară cave is to the West of Sălciua, at the bottom of Prislop peak. Waters from the cave entrance emerge mostly from superficial flows in the internal drainage area of Vânătara depression. Their only connexion to the karst is that they pass through the limestones, the karstic underground contribution to the hypogeum being rather low. It is only a supply of about 10 l/s, on the right side of the cave, probably partially fed by diffuse infiltrations in the area of North-East of Vânătara depression, where the presence of Albian sandy-marls lead to springs of low discharge.

Downstream to Huda lui Papară, at around 100 m, under the rocks on the right cliff, there are several springs of a cumulated flow of about 2 l/s, always clear, distinct from Vânătara-Huda lui Papară system. They are likely fed by water from springs on Pomnoale plateau, over the cave entrance, in the South-Eastern section of the entrance, flows which infiltrate in the limestones close to downstream of springs.

To know the debits of underground flow in the Huda lui Papară cave, a hydrometric section with a limnigraph was set up. The processing of data pointed out a hydrological regime similar to superficial flows. The value of recorded debits varied in between 50 and 3960 l-s with an average of 234 l/s and a high index of variability (119.2).

In the Vânătara internal drainage area there are places such as Ponor and Valea Poienii hamlets, as well as other isolated farmer households. They produce a high pollution of the superficial flows, mainly based on animal dejections. The short underground route of Vânatara slope and the exit of Huda lui Papara cave, as well as the lack of filtration zones of underground waters, lead to such waters being polluted at resurgence, a reason for which they are not used for human supply of the people in Sub Piatra hamlet.

At the origin of Poiana stream, in the Hopagi area, under the sandstones and conglomerates cover, some tithonian limestones intensely karstified come up in various areas of erosion. The aquifer accumulation of those, either diffusely fed by the aquifer placed in covering rocks, are discharged at the tectonic contact with marls and clays of Cretaceous age. The discharge is carried mainly by the Sileşti spring (Fig. 6.1 nr. 14), with an average debit of about 5 l/s.

Springs of the Cheia (Brădeştilor) stream. In the headwater of Cheia stream, on the left bank, under Tăul Tarcăului, at the contact of tithonian-barremian limestones with sandstones and conglomerates of Vraconian-Cenomanian, there are three major springs: Brădeşti, Topliţa 2 and Topliţa 1 (Fig. 6.1, nr. 16), with average debits of 4, 8 and respectively 7 l/s. They are fed by flows on the fields covered by keratophyres, waters infil-

trated in the underground in ponors of the plateau perimeter of the Tăul Tarcăului (Fig. 6.1 no. 15).

Scăriţa Pravului spring (Fig. 6.1 nr. 21). It is located in the spring area of Pravului stream and emerges from an agglomeration of limestone rocks in the terminal side of a canyon, difficultly accessible, traversed by the temporary flow of Aldiei valley. It has an average debit of 10 l/s and has deposits of limestone tuff.

6.2.2. Springs on the Eastern side of Trascău Mountains

Izvorul Ceţii (Fig. 6.1 nr. 23). Brook Cetei originates in Aldiei valley, a wide and grass-covered depression separating Tecşeştilor Mountain from Cetii Mountain. The stream collects some springs in a marshy-like area , marked by the presence of **Aldiei valley spring** (Fig. 6.1 no. 22), emerging in massive, cracked limestones, with a debit of 4 l/s, a highly appreciated supply by locals and that is never dry. Downstream, the debit of the stream is sensibly higher with the contribution of Cetii spring. The water of the spring emerges at the contact of limestone with keratophyres, in a massive agglomeration of limestone rocks, in three main sections on a distance of about 50 m. The average debit of the spring is 40 l/s.

Cetii spring, the spring of Valea Aldiei and Scăriţa spring in Pravului stream mainly drain the aquifer accumulations in the central sector of the main crest of Trascău Mountains, a sector bordered to North by Cheile Rîmeţului and to the South by the canyon of Galda. Secondly, the discharge of such accumulations is also based on springs on the Western side of carbonate deposits: Zede spring (Fig. 6.1 nr. 18), spring under Piatra Lupului, spring of Hoanca Vălăului, spring under Plai and Gurbeştilor spring, all of low debits, generally under 1 l/s.

In the central section of Trascău Mountains, in full limestone area, the presence of certain supplies and losses alongside an alignment parallel to the regional geological structure is noticeable: the springs of Portalul din Cheile Râmeţilor (Fig. 6.1 nr. 17), spring in Tecşeştilor Mountain (Fig. 6.1 nr. 20), the spring under Rogojina, Cumpăna spring, Ştivuroi spring (Fig. 6.1 nr. 24), Sub Colţuri spring and Cheile Galdei spring. Their emergence is connected to a plane of intraformational overthrusting which doubles the width of the limestones surface. Keratophyres fragments in diluvial deposits on this alignment support such a hypothesis, also marked in the geological map, at a 1: 50,000 scale, the Întregalde sheet.

6.2.3. Springs of Ciumerna platform

Ciumerna Platform is shaped by a plate of limestones, highly tectonized and karstified. The presence of unkarstifiable rocks in the perimeter of the platform favour the formation of aquifer accumulations in the area of Striglău peak. Their debit is very low, and the water infiltrates in the diffuse maner in limestone talwegs or in impenetrable ponors, such as Ponorul lui Mihai and Brânzei cave (Fig. 6.1 nr. 29), the spring and ponor of Striglău (Fig. 6.1 nr. 30).

Sandstones and conglomerates covering limestones to East of Băieşului peak, in the area named by the locals Cimerna, have higher accumulation than in Striglău and sustain springs of permanent debits of up to 1 l/s. In times of long drought, their debit is considerably lower. The waters of those springs, under short under-air passages, enter the limestone ground through the receptive Gura Calului cave (Fig. 6.1 nr. 35) and via the ponor of Ţuţuleu peak (Fig. 6.1 nr. 34), the last being also known as the ponor under Băieşului peak. The platform is surrounded by several major springs discharging the aquifer accumulations in carbonated deposits at the contact with surrounding rocks.

Izbucul Iezerului spring (Fig. 6.1 nr. 39) is located in the South-Eastern extreme of Ciumerna platform, where Iezer brook emerges up, a tributary of Ighiu stream. The source appear at the bottom of an agglomeration of limestone blocks, in three main points. The hydrological regime of the Izbucul Iezerului has been monitored based on a hydrometric section provided with a liminigraph. In the hydrological year under study, the average debit was 94 l/s with extremes in between 12 and 400 l/s.

Izbucul Iezerului is placed at around 300 m downstream to Iezerul Vârtopului lake (also known as Ighiel or Iezerul lake), with a 70 m difference in height to the minimal level of waters in the lake and 80 m to their maximum.

Iezerul Vârtopului is a natural lake, emerged, according to some authors, though the blockage of Ighiel stream by a high land sliding, while other

authors think is was because of a karstic capture process. It is permanently fed by several springs at the end of the lake (Fig. 6.1 nr. 38). The water of the lake partially or totally feeds the Iezerului spring via a whirl placed on the bottom of the lake, of an uncertain location.

Feredeu spring (Fig. 6.1 nr. 31), discharges to the North, to the watershed of Găldiţa stream the aquifer accumulations under Ciumerna plateau. It emerges from an agglomeration of limestone blocks, at 1000 m height, under the structural obsequent surface of Poiana Ascunsă, with an average debit of 10 l/s.

Burduvoaiei spring (Fig. 6.1 nr. 33), comes up from rocks at the bottom of an abrupt wall, of 130 m high, in the reservoir of Bolii stream, a tributary of Găldiţa in Sfârcuţa hamlet. Downstream the spring, Bolii stream is flowing temporary. The supply has an average debit of 15 l/s.

Topliţa spring (Fig. 6.1 nr. 37), is the only major karstic source in the drainage area of Lunca Meteşului stream. The spring emerges from limestone rocks under Coisca karstic depression, with a debit of 8 l/s and probably discharges aquifer accumulations in the perimeter of Gaura Calului inflow cave. The hydrogeological connection of those points was marked by using fluorsceine, an experiment undertaken by speleologists in Alba Iulia.

Spring of Hoanca Striglăului (Fig. 6.1 nr. 30), is a main supply of Ouălor stream, a tributary of Ighiu stream. It is probably fed by infiltrations taking place in the area of Striglău peak and is diffusely emerging in an agglomeration of small-scale blocks, with an average debit of 7 l/s.

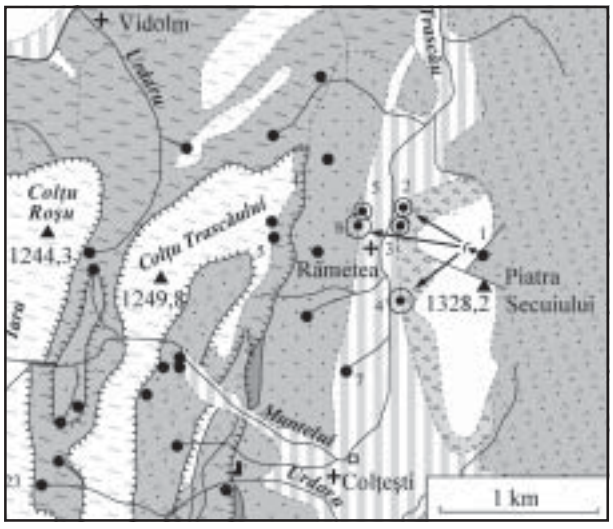

Figure 6.2. Hydrogeological map of Râmetea area (Legend as in figure 1.6).

Spring of Ţelna brook. In the high reservoir of Ţelna, among diluvia with blocks of limestone, close to keratophyeres/limestones boundary, two karstic springs come up. The one upstream is 8 l/s and comes up in a widened area, slightly alluvial, while the one downstream, of a 5/s debit, comes on the right mountain side, in a short valley, where lots of limestone blocks are left.

6.2.4. Piatra Secuiului and Trascău Depression

Piatra Secuiului Massive consists of Tithonian-Berriasian limestones, highly split and tectonized, of a ruinform relief, in quite an advanced ageing stage. At the bottom of limestones there are keratophyres, the contact of the two rocks being highly distinct by a different kind of erosion, eroding and taking away keratophyres quicker, affecting limestones that are kept in the relief, in vertical walls.

Their geological structure goes deep into the West, under deposits of filling in Trascău depression. The depression is affected by a system of vertical faults, NW-SE, dividing it into blocks of varied depth.

Limestones determine an area of impluvium completely deprived of superficial flows. Water falls on their surface feed almost exclusively the karstic aquifer accumulations, mainly located at the local area of Trascău depression. The supply is also based on a lower contribution of local aquifer accumulations in keratophyre diluvia in the crest of Piatra Secuiului, marked by springs of Valea Rea (Râpa Mare) brook, springs of a cumulated debit of about 0.2 l/s (Figure. 6.2, nr. 1).

Karstic aquifer accumulations are discharged in a series of springs, placed in the Northern area of Trascău depression, close to Râmetea locality: Fântâna de sub Piatra (Figure 6.2, no. 2; 3.8 l/s), Buha spring (Rojos, Patany, no. 3; 1 l/s), Fântânele spring (no. 4), source of Fântâna Oraşului and Fântâna Mică (no. 5; 6 l/s), source of Kindergarden (Teacher's spring, no. 6; 8 l/s), Fishery spring (no. 7). In the area of Râmetea, the karstic aquifer is confined, the Râmeţi Formation act as a caprock.

Fântânele Spring (Kokut) rise at the bottom of the Western side of Piatra Secuiului, ascendant by the alluvia of the valley. The mean discharge is 10,4 l/s, with variation between 5.5 and 16.5 l/s.

The springs have temperatures varying in between 10 and 11.5°C. The spring was systematically monitored in 1991-1992 to evaluate the physical, chemical and bacteriological data. The bacteriological seasonal content of Fântânele spring is low, and the bacteriological stability of water samples into bottles was appropriate. The water of the spring has calcium bicarbonate type of an average mineralization of 521 mg/l.

For a wider hydrogeological perspective of Piatra Secuiului- Trascău depression area, a tracer test with In-EDTA 10 g was undertaken, downstream Valea Rea spring (Figure 6.2, no. 1, 820 m altitude) in October 1990. The tracer emerged in the following sources: Fântâna de Piatra, Fântânele, Captarea Oraşului and in Teacher's spring, pointing out a single aquifer, of a fast underground water circulation. Tracer transit time was between 2 and 8 hours. The test was undertaken in cooperation with E. GAŞPAR and T. TĂNASE.

The central and Southern area of Trascău depression lacks surface water supplies, Colţeşti relying for collection on springs from Muntelui stream and Grădina Cetăţii spring, for human consumption.

6.2.5. Tureni - Petreștii de Sus area

North of Valea Arieşului, Tithonian upper Barremian limestones in Trascău Mountains go up to Tureni in Valea Racilor, and their hydrogeology was studied by G. BANDRABUR and RADU RĂDIŢA in 1994. These limestones make up a narrow stripe of about 1.5 km, 14 km long, with a 20 km^2 surface.

Dominant morphological elements of the landscape are Turzii gorges dug out by Hăşdate stream and Racilor gorges.

Limestones, massive and beded, have a monoclinal structure directed to West. They rest on ophiolites and have Badenian deposits in the upper section.

Aquifer accumulations in limestones, exclusively due to rainfalls, are discharged through several low debit springs, among which: "La Izvoară" spring, (9 l/s, Fig. 6.1, A, no. 1), "Moara de la Tău" spring (2 l/s, no. 2), the one at Cheile Turzii (0.2 l/s, no.3) and Copăceni spring (4.5 l/s, no. 4). Karst waters are Ca-HCO_3, with mineralizations of up to 650 mg/l. Close to Badenian deposits, karst waters have high sodium sulphate content , and their minteralization rise to 730.7 mg/l for "La Izvoară" and 954.3 mg/l for Copăceni springs.

References

Balintoni I., Iancu Viorica (1986): Lithostratigraphic and tectonic units in the Trascău Mountains, north of Mânastirea Valley. D.S.Institut Geologic, Bucharest, 70-71/5, 1983-1984, 45-56.

Balintoni I., Lupu M., Iancu Viorica (1987): Harta geologică a RSR, scara 1:50.000, foaia Poşaga. IGG, Bucureşti.

Bandrabur G., Radu Rădiţa (1994): Recherches hydrogeologiques dans la zone de Tureni-Petreştii de Sus (Roumanie). Utilisation de l'electrometrie en hydrogeologie. Theoretical and Applied Karstology 7, 109-114. Bucureşti.

Borcoş M., Berbeleac I., Bordea S., Bordea Josefina, Mantea Gh., Boştinescu S. (1981): Harta geologică a României, scara 1:50.000, foaia Zlatna. IGR., Bucureşti.

Bordea S., Bordea Josefina, Puricel R. (1965): Studiul geologic al regiunii dintre valea Iezerului şi valea Galdei (Munţii Metaliferi). D.S.Institut Geologic, Bucureşti, LI/1.

Cocean P. (1986): La genese des gorges du basin de la Vallee de Geoagiu. Trav. Inst. Speol. „E. Racoviţă", XXV.

Cocean P., Onac B. (1989): Le relief developpe sur les calcaires cristallins de la partie sud-est du Massif de Gilău-Muntele Mare. Univ. Babeş-Bolyai, Geologia-Geographia, XXXIV, 1, 11-19, Cluj-Napoca.

Ianovici V., Giuşcă D., Ghiţulescu T. P., Borcoş M., Lupu M., Bleahu M., Savu H. (1969): Evoluţia geologică a Munţilor Metaliferi. Editura Academiei RSR, Bucureşti. 741 p.

Ilie M. (1936): Recherches geologiques dans les Monts du Trascău et dans le Bassin de l'Arieş. An. IGG XVII, 329-466. Bucureşti.

Ilie M. (1950): Monts Metalliferes de Romanie. Recherches geologiques entre la Valea Stremţului et la Valea Ampoiului. An.IGR XXIII, 121-198, Bucureşti.

Lupu M., Borcoş M., Dimian M., Lupu Denisa, Dumitrescu R. (1967): Harta geologică a României, scara 1:200.000, foaia Turda. IGR, Bucureşti .

Lupu M., Bordea S., Popescu O., Nicolae I., Tatu M. (1991): Harta geologică a României, scara 1:50.000, foaia Întregalde, (manuscris). IGR, Bucureşti.

Mantea G., Tomescu Camelia (1986): Geologica structure of the Central area of the Metaliferi Mountains, Balşa-Ardeu-Cib zone. D.S.Institut Geologic,Bucureşti, 70-71/5, (1983-1984), 129-148.

Mârza I. (1969): Evoluţia unităţilor cristaline din sud-estul Muntelui Mare. Ed. Acad. RSR, Bucureşti, 166 p.

Nicolae I. (1985): Ophiolites of the Trascău Mountains (South Apuseni Mountains). An. IGG, vol. 65, Bucuresti.143-205 p.

Orăşeanu I. (2000): Contribuţii la cunoaşterea hidrodinamicii sistemelor acvifere carstice din Munţii Apuseni. PhD. Thesis, University of Bucharest, 256 p.

Russo-Săndulescu Doina (1976): Fereastra Boierişte de la valea Muncelului-Colţesti (Munţii Trascău). D.S., IGG LXII (1974-1975), 141-148, Bucureşti.