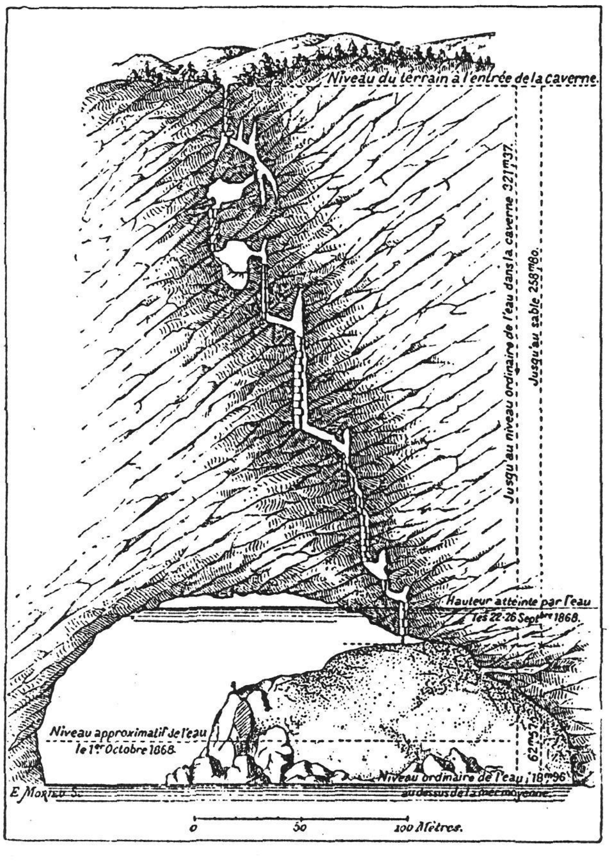
Speleological Association of Slovenia
and
Karst Research Institute ZRC SAZU

4th INTERNATIONAL KARSTOLOGICAL SCHOOL

Classical Karst



SHAFTS

Guide-booklet for the excursions
Postojna, June 1996

Organizer:
Karst Research Institute
Scientific Research Centre of the
Slovene Academy of Sciences and Arts

By the financial support of the
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Ministry of Science and Technology
Ministry of Environment and Physical Planing
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Postojna Commune

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PROGRAM

Monday, June 24, 1996

9.00 - 12.00 Opening of the school and lectures
13.30 - 19.00 Field work
Shafts on the Nanos plateau
Bus excursion with short stops and walks on rough karst terrain. No special equipment required, just terrain shoes and in case of rain an umbrella.

20.00 Reception in the hotel Jama

Tuesday, June 25, 1996

8.30 - 12.00 Lectures
13.30 - 20.00 Field work
Shafts, sinkholes of Matarsko podolje - Mejame, Brimščica, V Ponikvah, Dimnice
Bus excursion with stops and walking no more than 2 km at one time. No special equipment required, just terrain shoes and in case of rain some umbrella
Special tour for SRT: entrance parts of Mejame, swallet 175 m deep cave, will be prepared for a visit with SRT for smaller group. SRT personal equipment, boots.

Wednesday, June 26, 1996

8.30 - 12.00 Lectures
13.30 - 20.00 Field work
Shafts of Notranjska karst. Descent to Logaška jama cave, walk to Gradišnica.
Bus excursion with short walks and one cave in program. There is a 34 m entrance shaft, it will be equipped with a hand powered winch. Cave is dry and there is little mud in a cave. Cave shoes and terrain dress required. We shall provide some lights and helmets for participants.

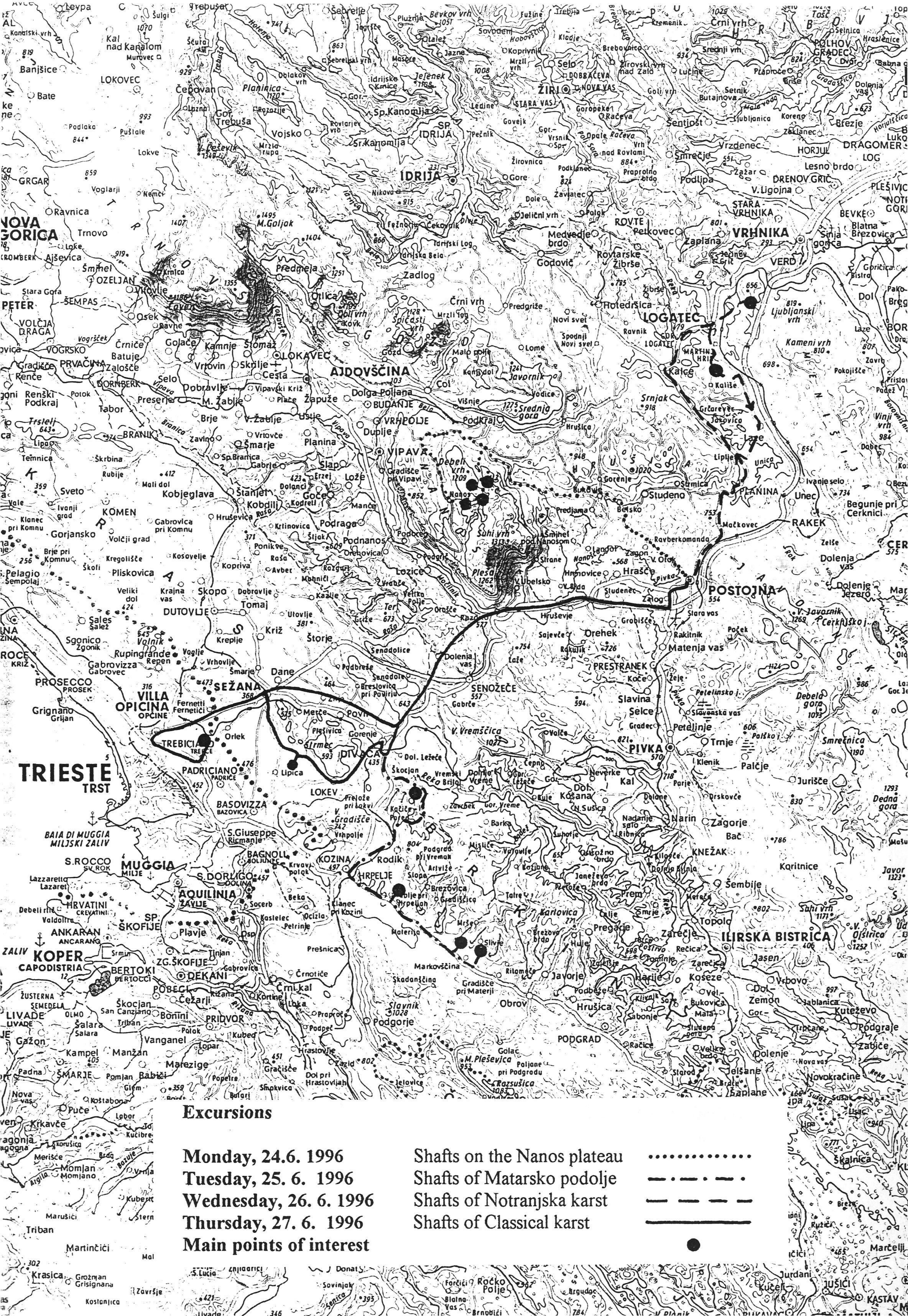
Thursday, June 27, 1996

8.30 - 20.00 Whole day excursion
Shafts of Classical karst: descent to Labodnica or Abisso di Trebiciano in Italy, lunch, surface walk to some shafts near Sežana and Lipica, Lipica Quarry.
Bus excursion with a visit of a 329 m deep cave Labodnica or Abisso di Trebiciano. Cave is basically a series of shafts rigged with fixed iron leaders. Good boots, are required. Cave needs about 5 hours to reach the bottom and return. After the cave, the lunch is organised.
For those, that have no visa for Italy or do not want to go so deep in a cave we shall prepare a special program.

Friday, June 28, 1996

Departure of participants

Departure for the field work and excursion will be from the parking in front of the hotel Jama. Suitable clothes and shoes are required. For smaller groups the trips to shafts with the SRT technique will be organised. If you are interested in this you need your personal caving equipment.


Excursions
Monday, 24.6. 1996 Shafts on the Nanos plateau
Tuesday, 25. 6. 1996 Shafts of Matarsko podolje
Wednesday, 26. 6. 1996 Shafts of Notranjska karst
Thursday, 27. 6. 1996 Shafts of Classical karst
Main points of interest
TRIESTE
TRST
NOVA GORICA
IDRIJA
AJDOVŠČINA
VIPAVA
LOGATEC
VRHNIKA
POSTOJNA
PLANINA
SEŽANA
DIVAČA
PIVKA
ILIRSKA BISTRICA
KOPER
CAPODISTRIA
MUGGIA
VILLA OPICINA
KOZINA
HRPELJE
SENOŽEČE
PODGRAD
RAKEK
UNEC
ŽIRI

SHAFTS ON THE NANOS PLATEAU

Monday, 24. 6. 1996

Postojna - Bukovje - Rjavi hrib - Ledeniški hrib - Abram - Blažon - Postojna

Nanos is high karst plateau, where deep karst is developed. The average altitude is around 1000 m, the highest top is Suhi vrh - 1313 m. In geological point of view the Nanos is consist mostly of limestones and dolomites of Jurassic and Cretaceous age. The thickness of the carbonate beds is 1000 m in average. The plateau is plunged fold, which is also overthrusted on Eocene Flysch rocks of Vipava valley and Postojna basin. The edges of plateau and main fault zones are in the Dinaric direction, NW - SE, and one of the most marked fissure zone is N - S direction. Practically all the underground water outflows from the aquifer across the lowest gap in the Flysch border in the Vipava springs at that position are some horizontal caves developed. But the dominant speleological feature at the top of plateau are vertical shafts. Some of them are just snow kettles or shafts and some of them are bigger stepped shafts. Ice and snow are common at the entrance part of the caves, in some cases ice is permanent. In the past ice was used by the local people, these caves have name Ledenik - glacier.

1. Veliki Trški Ledenik

Reg.No.: 912; location: between Debeli hrib and Štefanov hrib; a.s.l.: 960 m; depth: 50 m; type: shaft with permanent ice; lithology: K_1 - limestone with layers of dolomite; genesis: obvious connection to a N-S fissure zone; other: two small natural arches, remains of wooden ladders, under the W wall small opening to 20 m deep shaft - connected to the E-W fault direction.

2. Brezno ob Matjaževi poti

Reg.No.: 2464; location: N slope of Rjavi hrib; a.s.l.: 1010 m; depth: 30 m; type: shaft; lithology: K_1 - limestone with layers of dolomite; genesis: widening by the solution of fissures (N-S, NW-SE) in broken zone.

3. a. Mali Trški Ledenik, b. Slapensko brezno pri Malem Trškem ledeniku

a. Reg.No.: 916; location: at Jamce SE from Rjavi hrib; a.s.l.: 990 m; depth: 50; type: shaft with permanent ice; lithology: K_1 - limestone with layers of dolomite; genesis: breakdown of cave roof - inner shaft connected to fissure; other: entrance in dolomite

b. Reg.No.: 2467; location: at Jamce SE from Rjavi hrib; a.s.l.: 990 m; depth: 35 m; type: shaft; lithology: K_1 - limestone with layers of dolomite; genesis: breakdown of cave roof - inner shaft connected to fissure; other: entrance in dolomite.

4. Brezna v Jamcah (a. Spodnje, b. Srednje and c. Zgornje brezno v Jamcah)

a. Reg.No.: 913; location: at Jamce SE from Rjavi hrib; a.s.l.: 1010 m; depth: 22 m; type: shaft; lithology: K_1 - limestone with layers of dolomite; genesis: vertical snow kettle; fault in 315^0 direction crosses the entrance.

b. Reg.No.: 914; location: at Jamce SE from Rjavi hrib; a.s.l.: 1010 m; depth: 78 m; type: shaft; lithology: K_1 - limestone with layers of dolomite; genesis: solution shaft; other: shafts b. and c. are connected at the bottom.

c. Reg.No.: 915; location: at Jamce SE from Rjavi hrib; a.s.l.: 1010 m; depth: 78 m; type: shaft with permanent ice; lithology: K_1 - limestone with layers of dolomite; genesis: solution shaft in the fault line; other: shafts b. and c. are connected at the bottom, at 10 m shaft is almost blocked by wood and gravel.

5. Slapenski Ledenik

Reg.No.: 2464; location: NW slope of Ledeniški hrib; a.s.l.: 1000 m; depth: 112 m; type: shaft with permanent ice; lithology: K_1 - limestone with layers of dolomite; genesis: the entrance is in collapse doline, develop is connected to the bedding planes (dip of limestone beds is 135/ 30 - 90) and to fissure zone in N-S direction; other: remains of wooden ladders, before 1981 just first shaft was known, in that time was open small passage in the ice to the next 65 m deep shaft (on the map at point 5).

6. a. Brezno pri Slapenskem ledeniku, b. Brezno 2 pri Slapenskem ledeniku

a. Reg.No.: 2466; location: NW slope of Ledeniški hrib; a.s.l.:1030 m; depth: 60 m; type: shaft; lithology: K_1 - limestone with layers of dolomite; genesis: solution shaft connected to the fissure in N-S direction.

b. Reg.No.: 5213; location: NW slope of Ledeniški hrib; a.s.l.: 1020; depth: 38 m; type: small horizontal cave with shaft; lithology: K_1 - limestone with layers of dolomite; genesis: snow kettle and at E wall is small opening to the cave.

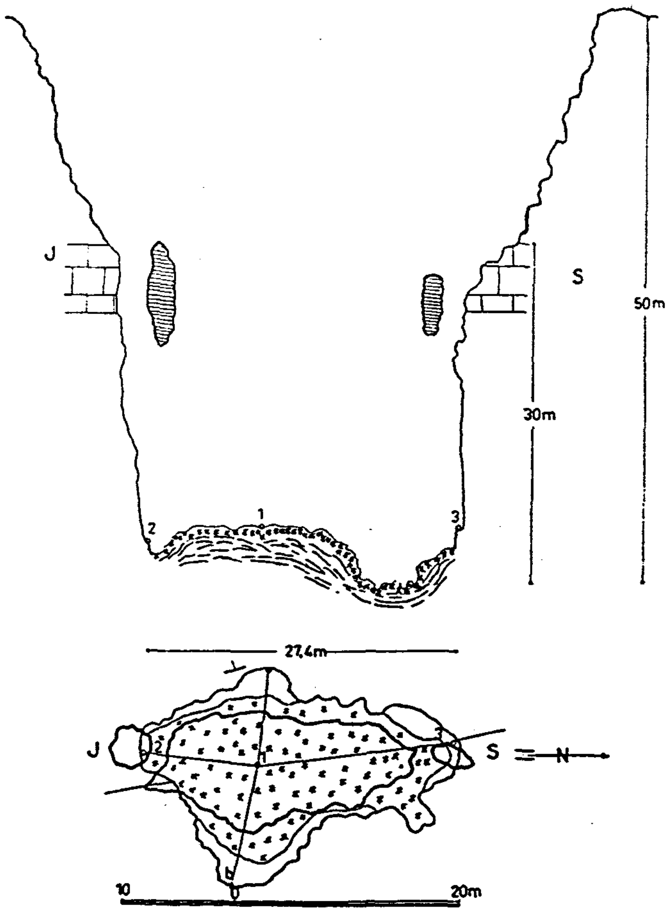
7. Strmadna

Reg.No.: 2468; location: NW slope of Ledeniški hrib; a.s.l.: 1060 m; depth: 218 m; type: stepped shaft; lithology: K_1 - limestone with layers of dolomite; genesis: opening in tectonic broken limestone, main direction of fissures are N-S and NNW-SSE.

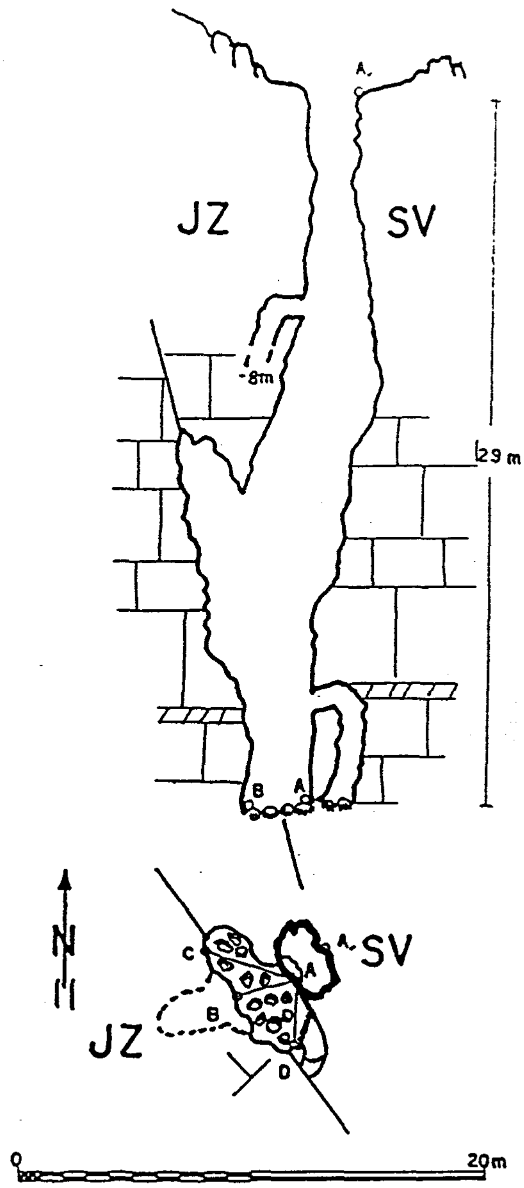
8. Loški Ledenik

Reg.No.: 917; location: S from the road Ledeniški hrib - Abram; a.s.l.: 970 m; depth: 24 m; type: shaft with permanent ice; lithology: K_1 - limestone with layers of dolomite; genesis: snow kettle developed in N-S fissure zone, thin beds; other: remains of wooden ladders.

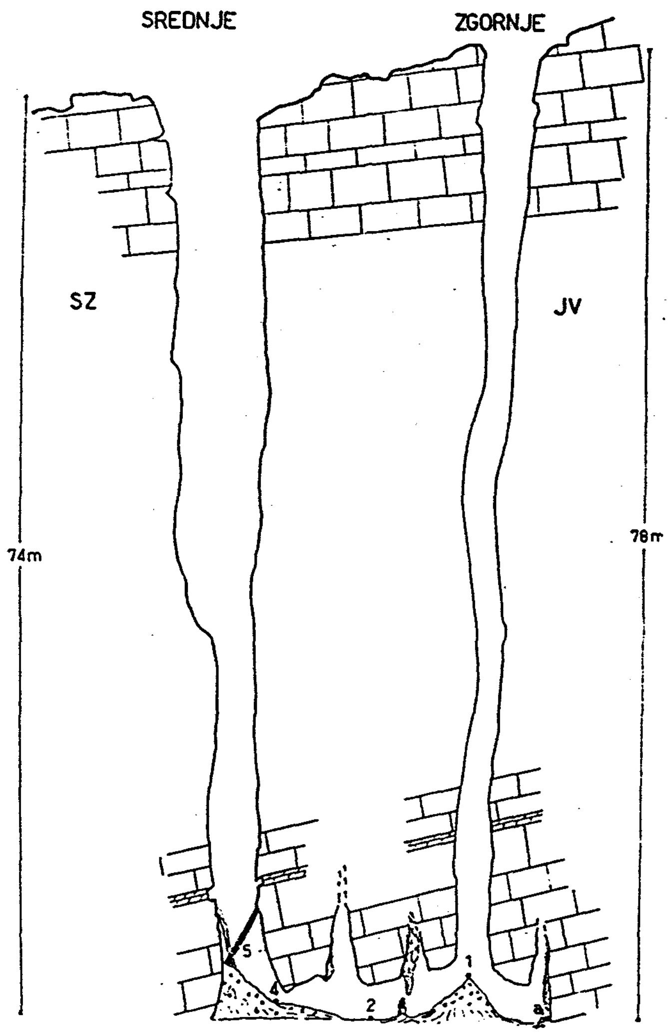
VELIKI TRŠKI LEDENIK

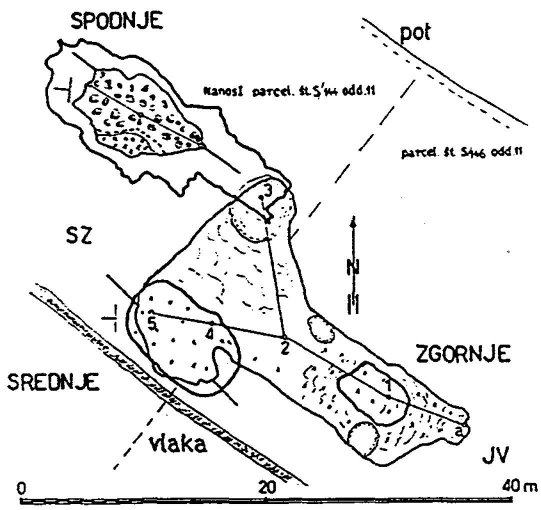


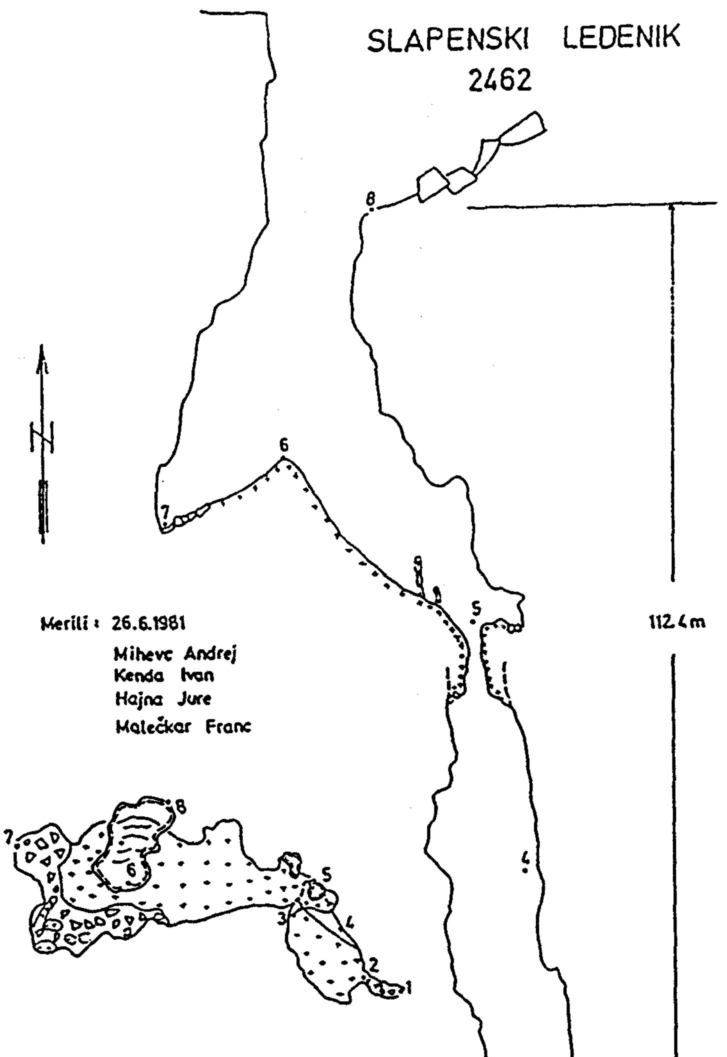
BREZNO OB MATJAŽEVI POTI

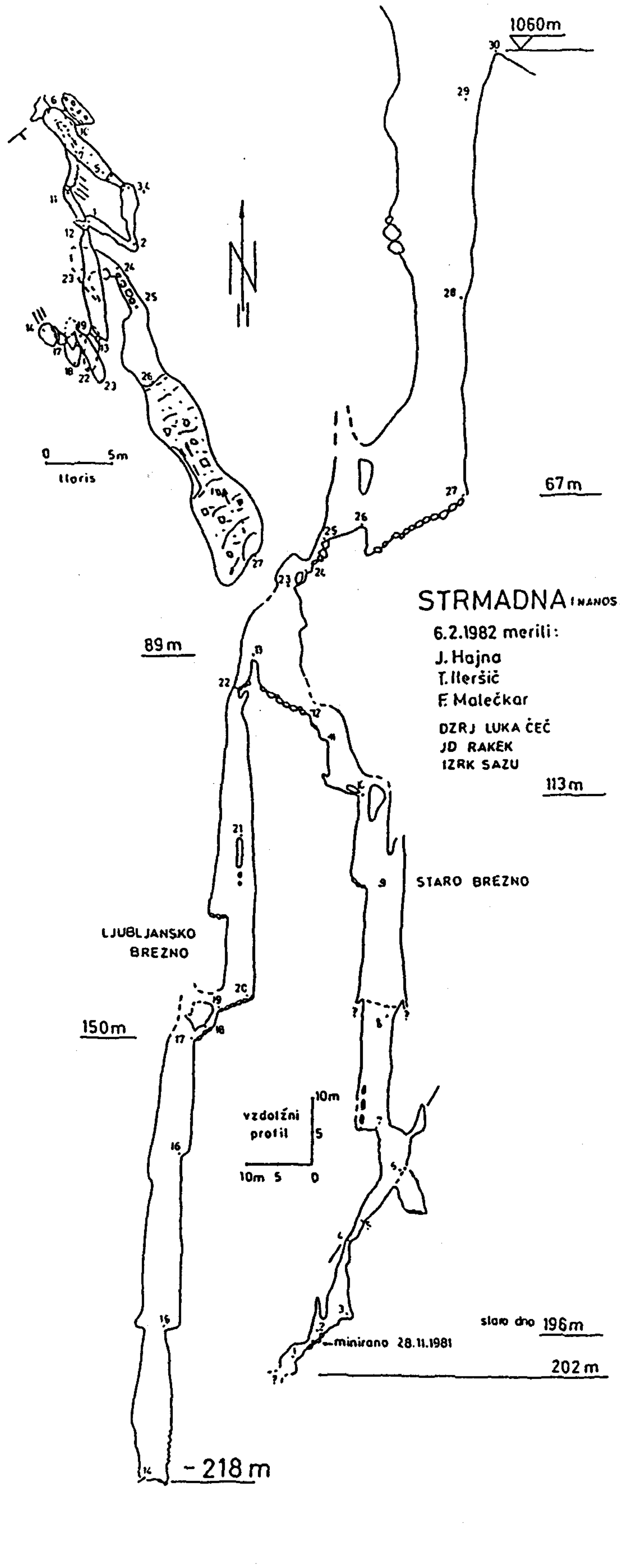


TRI BREZNA V JAMCAH





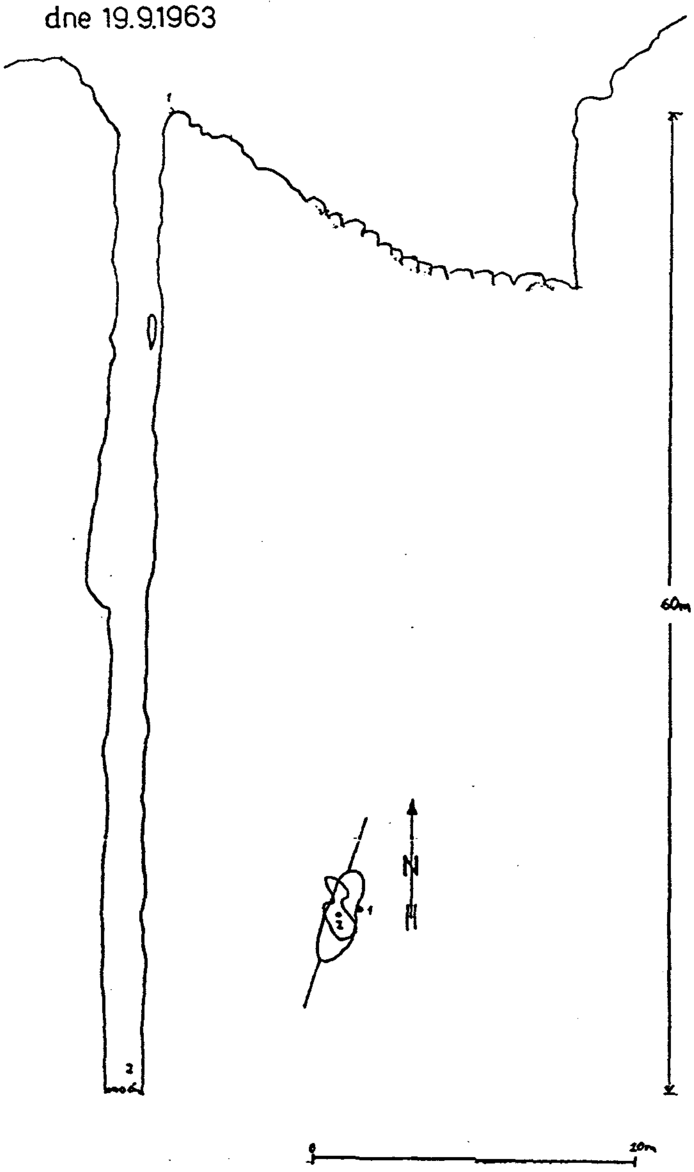

SLAPENSKI LEDENIK
2462
112.4m
Merili: 26.6.1981
Mihevc Andrej
Kenda Ivan
Hajna Jure
Malečkar Franc
0 10 20 30m

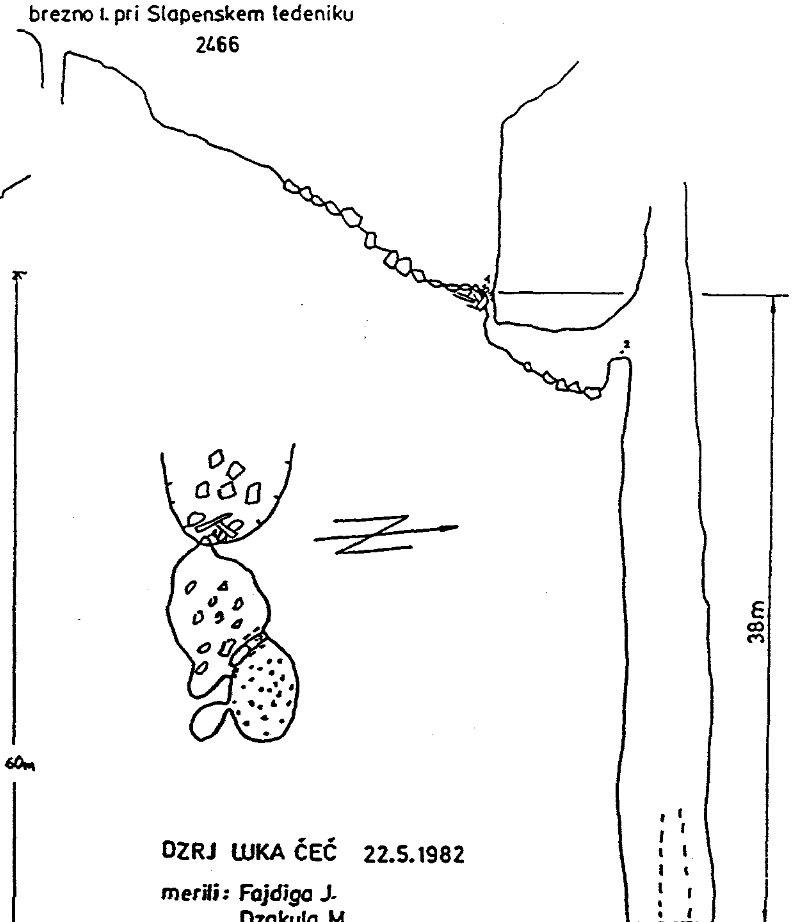

1060m
0 5m
tloris
67m
STRMADNA (NANOS)
6.2.1982 merili:
J. Hajna
T. Ileršič
F. Malečkar
DZRJ LUKA ČEČ
JD RAKEK
IZRK SAZU
89m
113m
STARO BREZNO
LJUBLJANSKO
BREZNO
150m
vzdolžni
profil
10m
5
10m 5 0
staro dno 196m
minirano 28.11.1981
202m
-218m

BREZNO II PRI SLAPENSKEM LEDENIKU

BREZNO I PRI SLAPENSKEM LEDENIKU

dne 19.9.1963

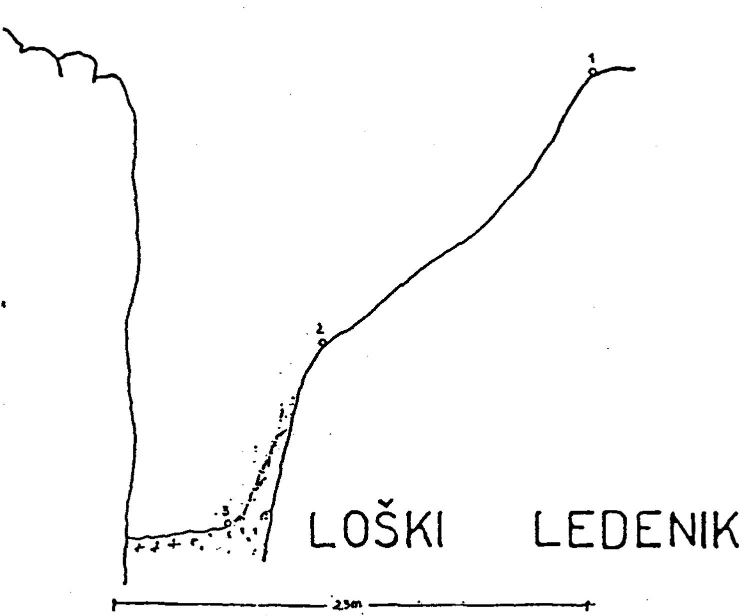




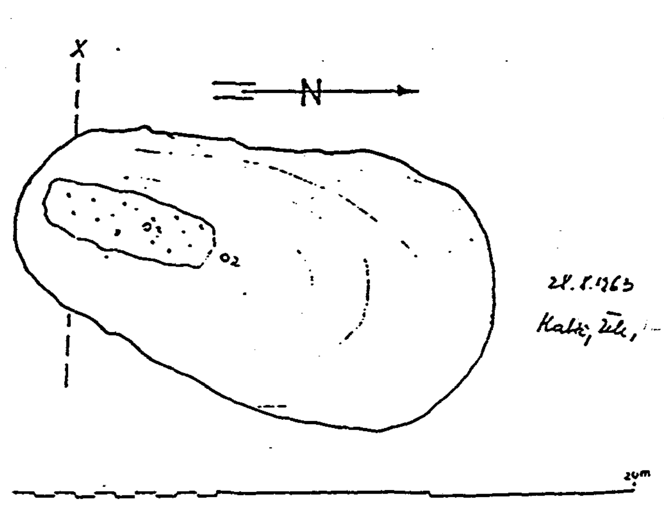
DZRJ LUKA ČEČ 22.5.1982

merili: Fajdiga J.
Dzakula M.
Hajna J. (risal)

M 1:250



LOŠKI LEDENIK



28.8.1963

SHAFTS OF MATARSKO PODOLJE
Tuesday, 25. 6. 1996

Postojna - Divača - Škocjan - Dane - Kozina - Markovščina - Postojna

Matarsko podolje is a belt of lower karst between non karstic Brkini hills and limestone Slavnik massive, built by Paleocene and Cretaceous limestones. It is 20 km long and 2-5 km wide. It has flat bottom, disseminated by the dolinesis inclined northwestwards. In the longitudinal section the lowered surface gently raises from about 490 m on NW to 650 m on SE side.
From flysch hills to the border limestones 17 separated sinking streams flow, draining altogether 29.2 km^2 of the flysch area. Water basins of the sinking streams vary from 0.5 km^2 to the biggest 13.2 km^2.
The brooks sink in the altitudes between 490 to 510 m a.s.l., most of the sinks are shafts. Some of them are continue in the accessible caves ending by the siphons of captured water in the altitudes between 370 to 430 m. The deepest cave is 150 m deep, and the longest is 6 km long.
There are more than hundred vadose caves, mostly shafts and some remnants of old horizontal caves in the karst plain. In one cave, Jazbina v Rovnjah only the water could be reached at 350 m of the altitude. Water tracing showed the diversion of the sinking streams water into three groups of springs. The lowest are along the coast in the Kvarner Bay and the highest are the Rižana springs at 70 m a.s.l.

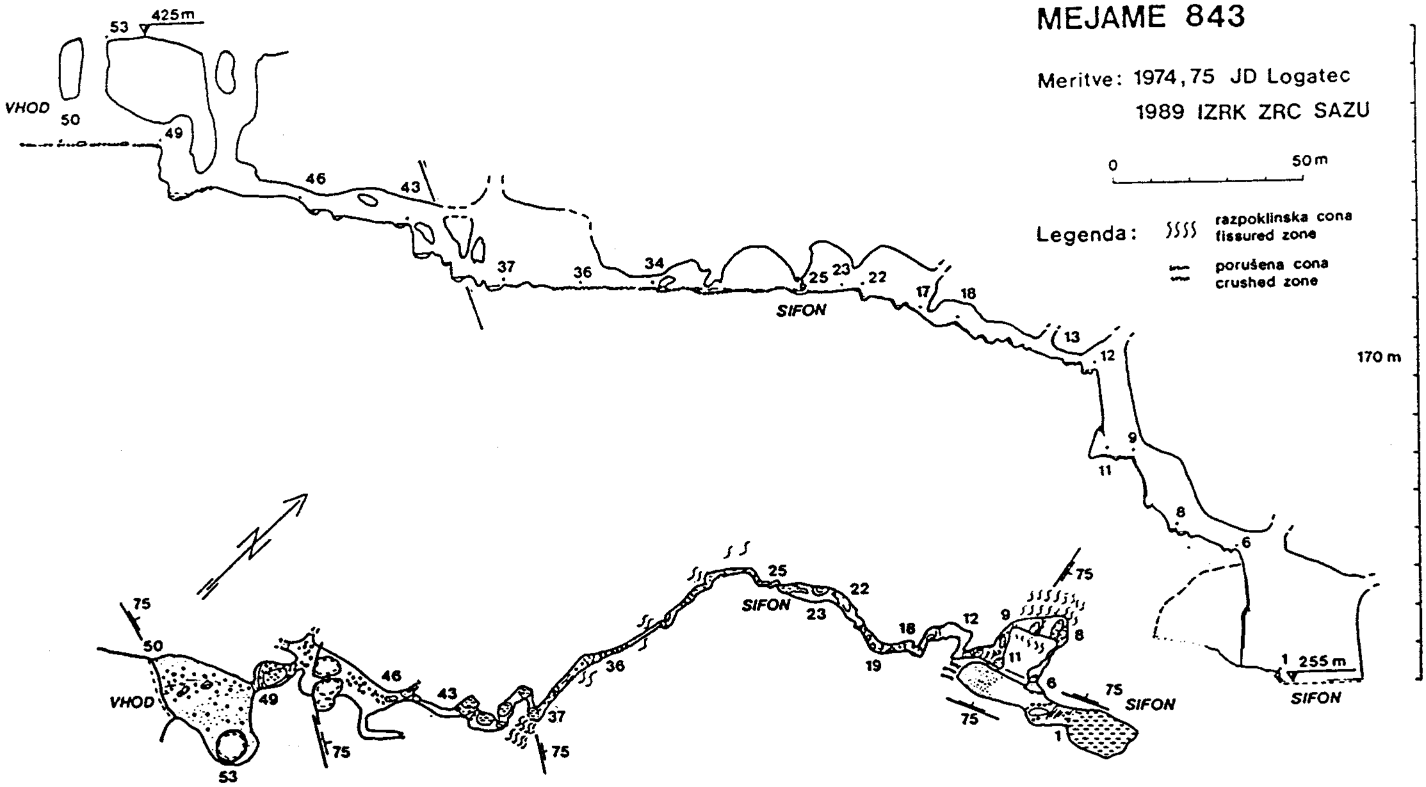
1. Mejame
Reg. No.: 843; location: blind valley S of Skocjan; 400 m a.s.l., 173 m deep. Paleogene limestone. Cave is a permanent ponor of brook Golobert. Several entrances are followed by narrow gallery which descents in small drops to the terminal shaft at 227 m a.s.l.

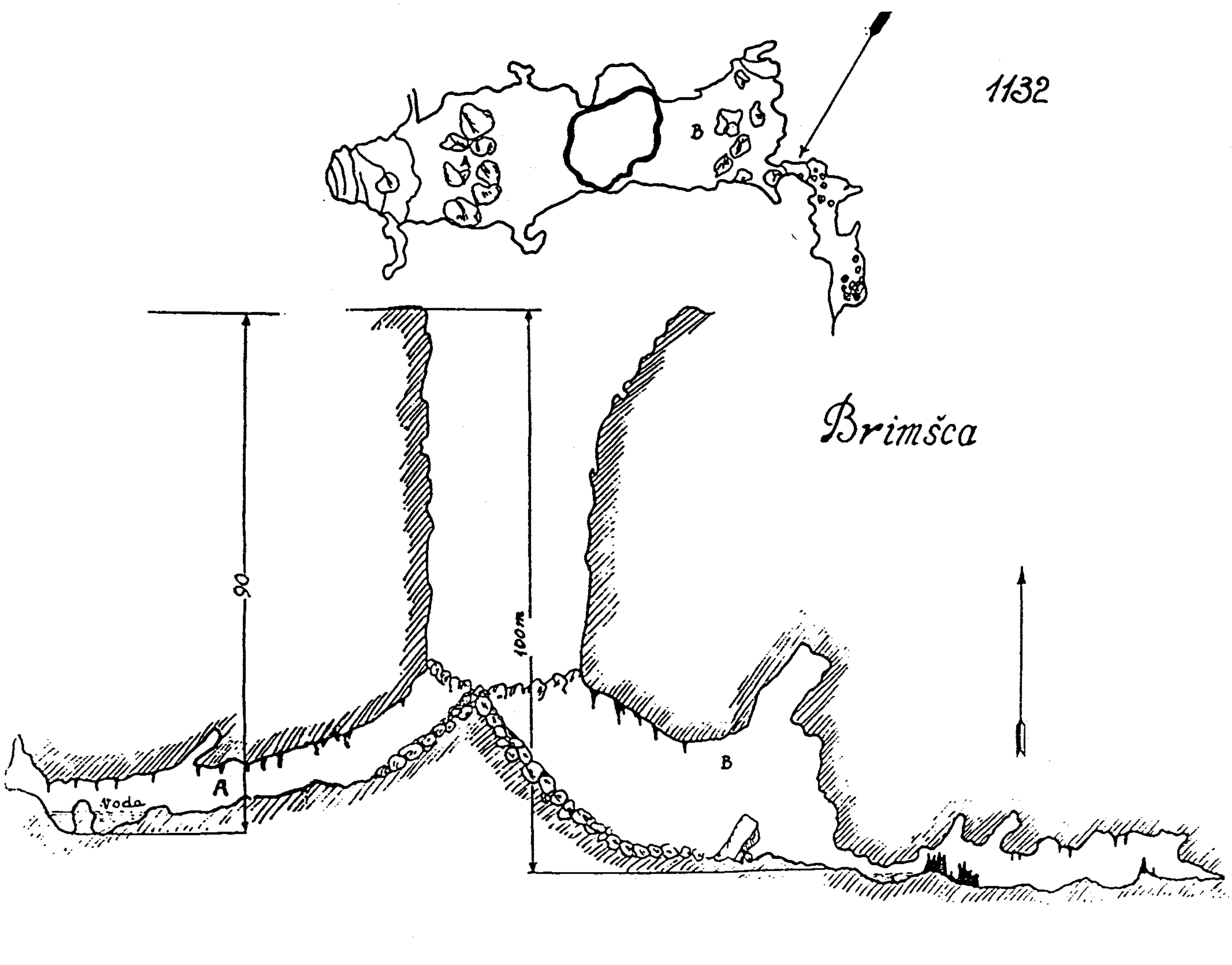
2. Brimščica
Reg. No. 1132, location on the southern edge of Brezovica blind valley; 524 m a.s.l.. 70 m deep entrance shaft continues is entering about 150 m long and dry gallery.

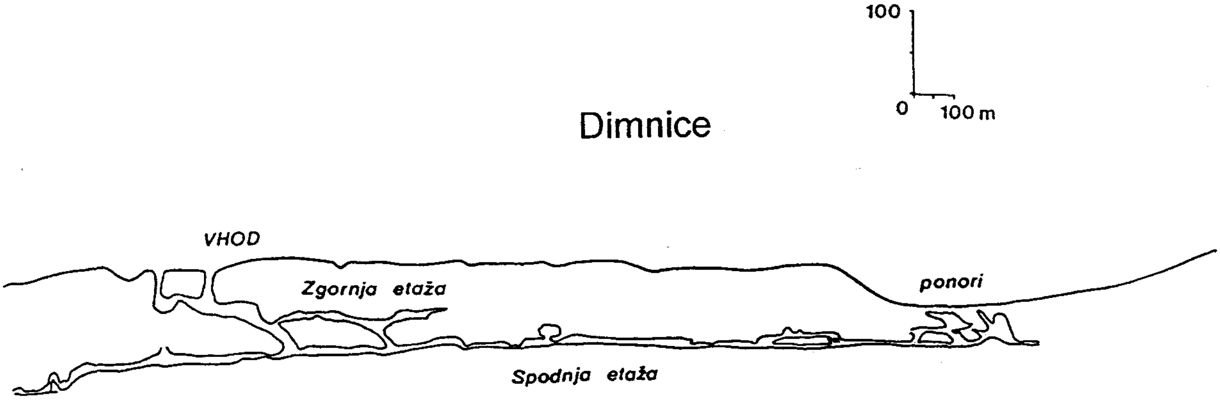
3. V Ponikvah, Hotiške ponikve
Reg.No.: 1173; location: ponor of the brook in Hotična blind valley; 538 m a.s.l., 144 m deep; paleogene limestone. Cave is a permanent ponor of the brook. After entrance is a serie of shafts and inclined galleriesis leading to the terminal sump which is 394 m a.s.l.

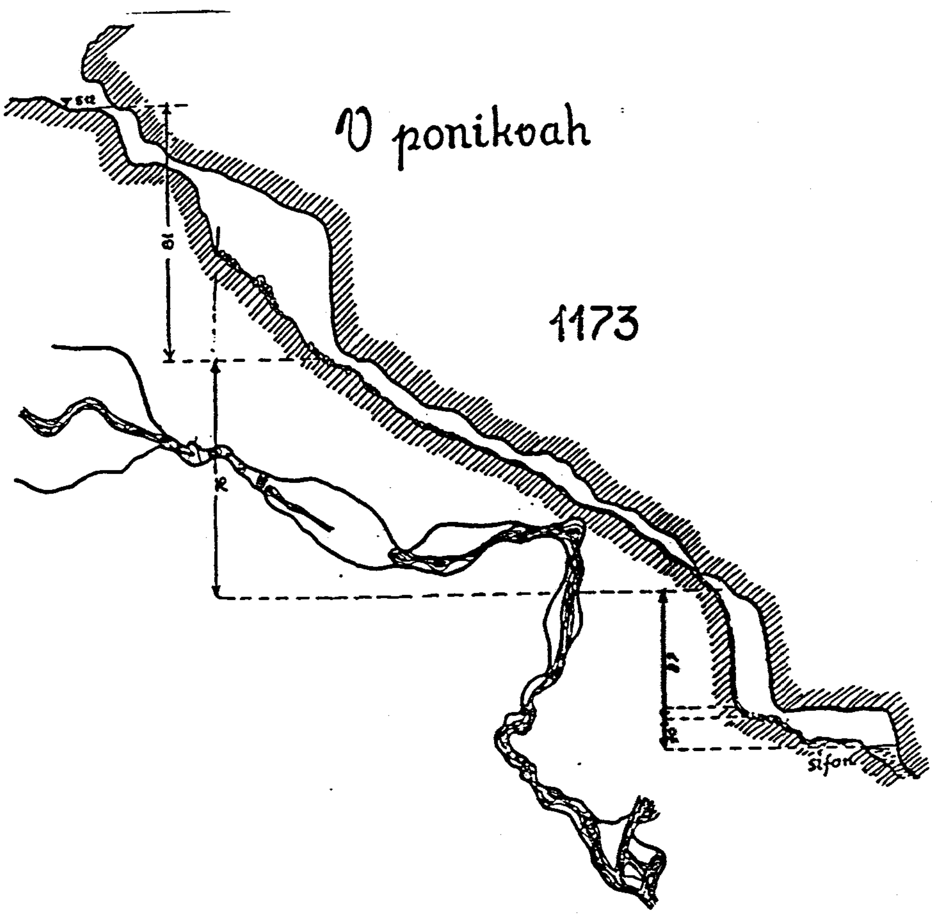
4. Dimnice
Reg. No.: 736; location: on karst surface with many dolines W of Male Loče blind valley; 567 a.s.l.; paleogene limestone. There are two shafts, entrances to a two level 6020 m long and134 m deep cave. Shafts are 40 - 50 m deep, opening above large collapse chambers. Ther is a strong air current in them, much influencing the climate of the cave.

Special tour for SRT: entrance parts of Mejame, 175 m deep cave, will be prepared for a visit with SRT for smaller group. SRT personal equipment, boots.


MEJAME 843
Meritve: 1974,75 JD Logatec
1989 IZRK ZRC SAZU
0
50 m
Legenda:
razpoklinska cona
fissured zone
porušena cona
crushed zone
VHOD
SIFON
425 m
170 m
255 m


1132
Brimšca
90
100 m
A
B
Voda


Dimnice
100
0
100 m
VHOD
Zgornja etaža
ponori
Spodnja etaža


V ponikvah
1173
sifon

SHAFTS OF NOTRANJSKA - Logaška jama
Wednesday, 26. 6. 1996

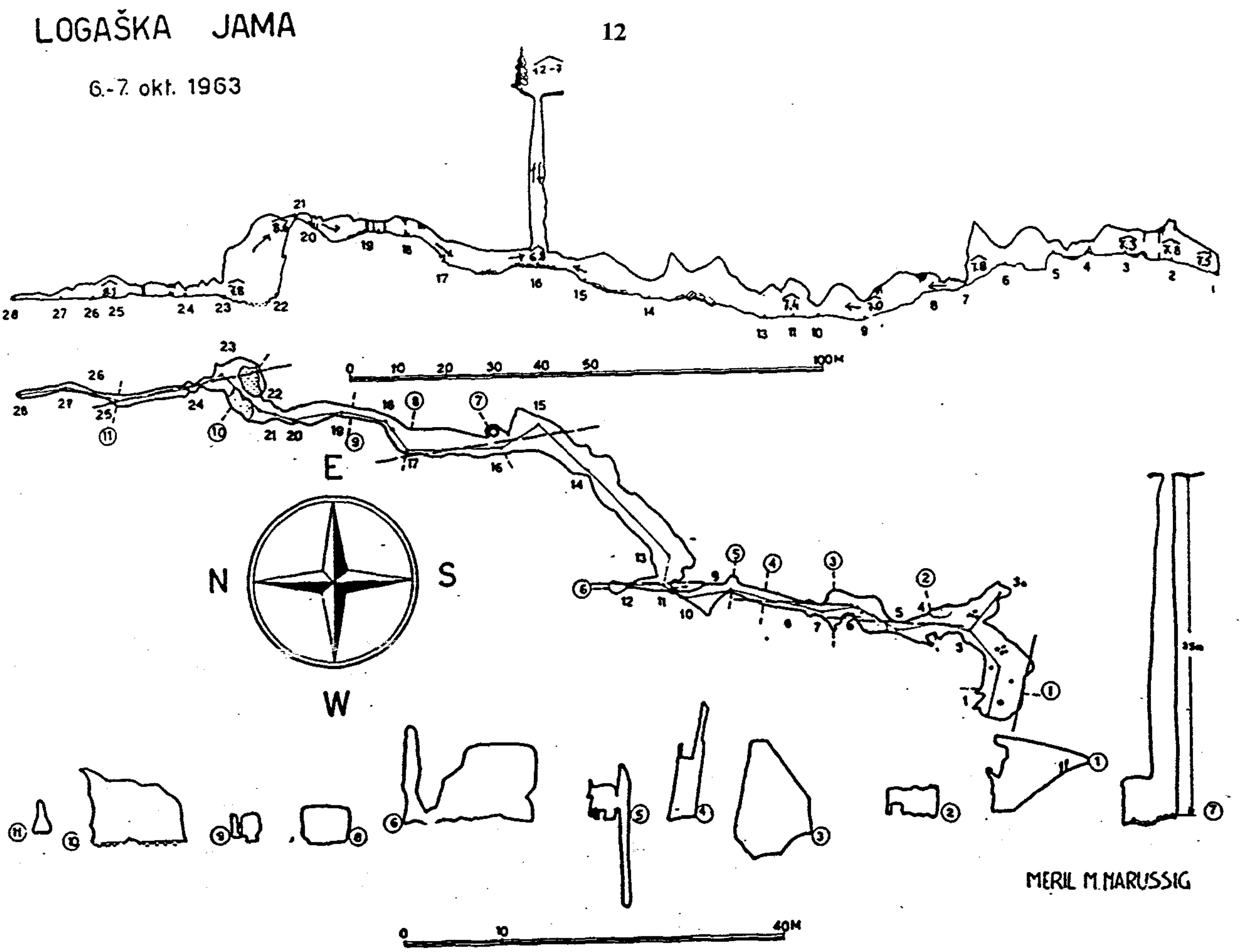
Postojna - Logatec - Logaška jama cave - Gradišnica cave - Postojna

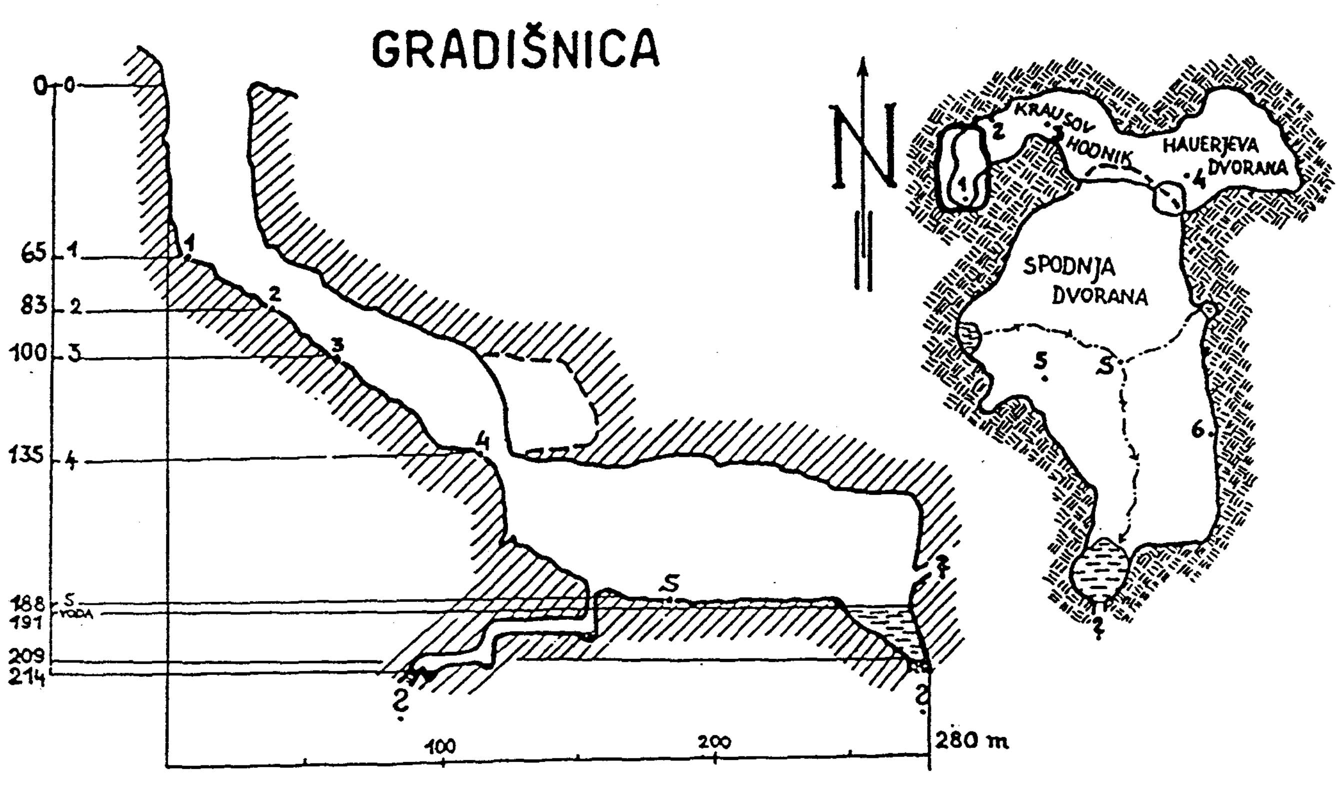
Bus excursion with short walks and one cave in program. There is a 34 m entrance shaft in Logaška jama, it will be equipped with a hand powered winch. Cave is dry and there is little mud in a cave. Cave shoes and terrain dress required. We shall provide some lights and helmets for participants.

Descent to Logaška jama cave, walk to entrance of Gradišnica.

1. Logaška jama
Reg. no.: 2490; location: karst plateau N of Logatec; 517 m a.s.l., 49 m deep, 280 m long. Lithology: cretaceus limestone. Cave was discovered in the winter, when the snow around blocked entrance melted. Entrance shaft is 35 m deep and opens into a inactive horizontal gallery.

2. Gradišnica
Reg.no.: 86; location: Gradišče hill south of Logatec, 577 m a.s.l. 227 m deep cave. Cave was first described by Valvasor in 17. Century, and explored by W. Putick in 1886. Entrance shaft is 65 m deep, developed along a set of fractures in N-S direction. At the bottom of the cave there is a large room, where water oscillations for about 50 m are recorded.


LOGAŠKA JAMA
6.-7. okt. 1963
E
N
S
W
100M
40M
MERIL M. NARUSSIG


GRADIŠNICA
N
KRAUSOV HODNIK
HAUERJEVA DVORANA
SPODNJA DVORANA
0
65
83
100
135
188
191
209
214
VODA
100
200
280 m

SHAFTS OF CLASSICAL KARST - Abisso di Trebiciano

Thursday, 27. 6. 1996

Bus excursion with short walks and one cave in program. There is a 270 m of vertical descent down the fixed ladders. Cave is dry and there is little mud in a cave. Cave shoes and terrain dress required. We shall provide some lights and helmets for participants.

1. Abisso di Trebiciano

Entrance to Labodnica or Abisso di Trebiciano cave is in a shallov doline in altitude of 341 m a.s.l. Cave is formed in upper cretaceous limestone and dolomitic limestone. Cave consists of a series of parallel shafts which hit a large room formed by the underground Timavo river. Cave was explored in 1841 to the depth of 329 m and was for a long time the deepest cave of the world.
A karstogenetic study based on a very detailed geomorphologic survey of the Abisso Trebiciano has been carried out (F. Forti, R. Semeraro, F. Ulcigrai 1978). Four geomorphologic units have been distinguished, corresponding to rock properties. The relationships between the karstic phenomenon of the Abyss end the structural characteristics of the rocky complex have been deduced. Fracture systems affected by karstification in the cave are mainly subvertical N-S and to a lesser extent the ESE - ONO.
Main morphotypes of the cave are:
1) The vertical shafts, generally found on a number of subparallel fractures and rarely on one single fracture, with transverse sections o a subcircular nature or a helical or fissured form; there are small waterfall thresholds with regressive erosion phenomena occasionally marks of currents which testify to episodes of the forced flow of water.
2) The gorges, small galleries which are sometimes meander channels and sometimes a ceiling channels and current marks.
3) The galleries in the vadose zone, relics of older more extended systems, with clayey deposits and of calcite formation placed at various heights.
4) The galleries in the epiphreatic zone: these are the channels of the River Timavo whose roof often appears to be perforated by numerous aven; the presence of large blades of rock is characteristic.
5) The Lindner Cavern, very extensive, at the bottom of which the River Timavo runs. The base is covered by great rocky blocks end considerable deposits of sand. The genesis of the Lindner Cavern may be attributed to the action of the River Timavo.
The deposits found in the Trebiciano abyss are of red clays in the vadose zone channels, silt, sands and gravel in the Lindner cavern and clastic detritus distributed more or less everywhere; there are also some speleothems.

2. Lipica quarry

Of the great number of quarries in Karst, now only the Lipica quarry is active. There are two kinds of limestone suitable for ornamental purposes in the building industry, in the stonemasonry nominated "fiorito" and "unito". From bottom to top in the Lipica quarry section two lithological intervals are present: - lower interval ("fiorito") is one of the coarse grey micritic limestones with the period of hippuritid and radiolitid biostroms - upper interval ("unitd') is the massive bedding bioclastic limestone with very fine rudist fragments. The fossil fauna is typical of the Upper Senonian age.

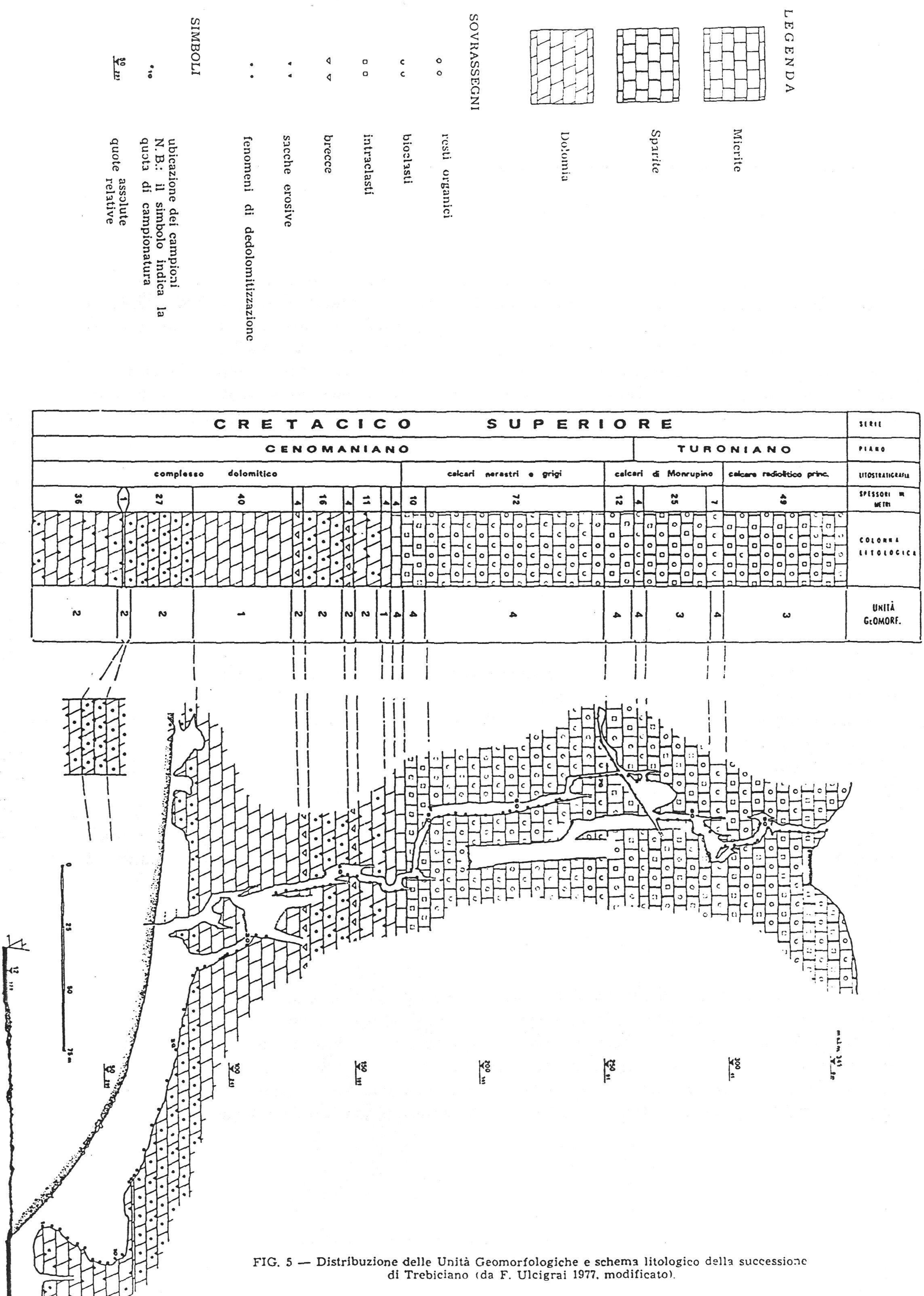


FIG. 5 — Distribuzione delle Unità Geomorfologiche e schema litologico della successione di Trebiciano (da F. Ulcigrai 1977, modificato).

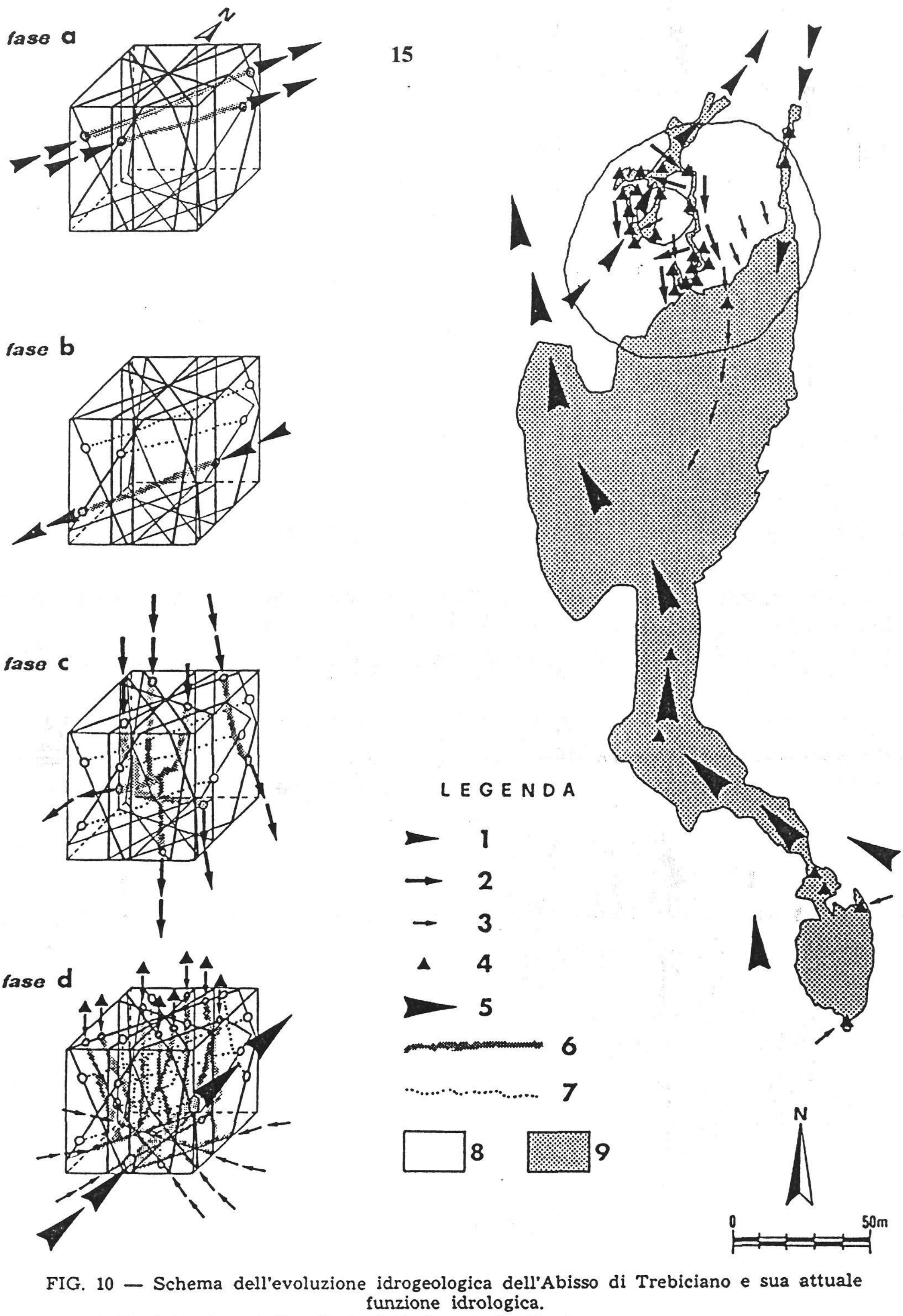


FIG. 10 — Schema dell'evoluzione idrogeologica dell'Abisso di Trebiciano e sua attuale funzione idrologica.

1 = deflussi in sistemi di gallerie (attualmente inattive);
2 = deflussi in sistemi di pozzi e forre (attualmente inattivi);
3 = intense percolazioni localizzate e ruscellamenti (attualmente attivi);
4 = principali camini di percolazione (attualmente attivi);
5 = attuale deflusso del F. Timavo ipogeo;
6 = condotte idrologicamente attive (relativamente alla fase considerata);
8 = area della dolina di Trebiciano;
9 = area della cavità.

fase a) formazione delle prime gallerie suborizzontali (gC di Fig. 3) impostate secondo le fratture incarsite; le portate d'acqua risultano notevoli per la ridotta dispersione delle acque nel corpo roccioso.

fase b) progressiva migrazione verso il basso dei corsi d'acqua ipogei in conseguenza di un probabile abbassamento del livello di base generale (gH di Fig. 3); il passaggio graduale dai flussi in pressione agli scorrimenti a pelo libero determina, nell'ambito di stesse cavità, l'associarsi di fenomeni erosivi a quelli dissolutivi.

fase c) la progressiva diffusione del carsismo determina la formazione di pozzi e forre che intercettano, interrompono e troncano le grandi gallerie formatesi nelle fasi precedenti.

fase d) è la fase attuale; l'attività idrologica è legata ad una percolazione estremamente diffusa con locali concentrazioni in corrispondenza dei camini che si aprono soprattutto al di sotto delle aree di impluvio delle doline. Il F. Timavo ipogeo scorre in sistemi di grandi gallerie e drena gli apporti idrici della massa rocciosa immediatamente circostante.

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ABSTRACTS OF THE PAPERS TO BE PRESENTED

MEDJAME (SAMOBORSKO GORJE) AN EXAMPLE OF FORMING SHAFTS IN UPPER TRIASSIC DOLOMITE

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The origin of karst phenomena in Samoborsko gorje is generally connected with Upper Triassic dolomite and Miocene Lithotamnium limestone. Among them, the most interesting are the shafts in the area of Medjame, near the town of Samobor. There are a few of them originating at different stages of developement.

The shafts originated in Upper Triassic dolomite by widening fissures in larger cavities along wich an incasion occurs, so some of them have elongated entrances. They are of different dimensions, but it is impossible to define their exact depth because they are partially or completely filled with waste. Along with the shafts entrances there are some clearly observable groovelike subsidences that suggest the presence of similar fissures found underground. About 500 m NW of Medjame area, the Podzvir creek sinks. The creek springs again from Podzvir cave at the place of contact between impermeable Lower Triassic beds and Upper Triassic dolomite in which the Medjame shafts are formed. Since the Podzvir creek flows underground below the Medjame shafts, the injourius matters (from waste thrown into the shafts) probably pollute its water and so they are transported downstream. But the creek is polluted even before it sinks, because its ponor is also filled with waste. Due to the specific movement of water in karst, the pollution of the Medjame shafts and the Podzvir creek is fatal for wider area and its habitants.

GEOLOGICAL STRUCTURES AND LOCATION OF SHAFTS IN POSTOJNSKA GMAJNA

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The region of Postojnska gmajna was tectonic-lithological mapped in detail (Čar, 1984 and Šebela, 1994). Beside lithostratigraphical data fault systems and deformations near them are of special interest.

We marked all smaller and bigger caves, shafts and rock shelters, which were registered in the field. For this case we studied also Cave Cadaster from where all the concerned caves were included and complemented.

Postojnska gmajna is cut by numerous Dinaric oriented fault zones with significant accompanying deformations. Very big number of shaft entrances lies in different broken and fissured systems which originate from tension stress conditions between two stronger fault zones.

The analyses showed 3 basic possitions of shaft entrances according to tension deformations with some variations.

BREZNO POD VELBOM ON KANINSKI PODI PLATEAU, THE WORLD'S DEEPEST VERTICAL SHAFT

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Kaninski podi is a high alpine karstic plateau in Julian Alps. This plateau, together with the nearby Goričica (Rombonski podi) is well known for its many deep caves.
Brezno pod velbom is now 541 meters deep. Its most interesting feature is 501 meters deep entrance shaft, which is the world's deepest known vertical shaft so far.
A quick revue of exploration will be presented, together with the morphology of shaft and the surface in vicinity to the entrance. Attention will be also paid to the ice in the shaft, which reaches almost to the bottom.

DEVELOPMENT OF CAVITIES IN VIEW OF THE CLIMATIC AND DYNAMICAL MORPHOLOGY

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Below the stony high Alpine karst surface which is without soiL and vegetatal cover, the solution potential of the precipitation water is as deep as the water circulation. There the establishing of the equilibrium of the p_{CO2} in atmosphere and in water in the process of solution which resulted in the mineralisation up to 70/85 mg $CaCO_3$+$MgCO_3$/l, makes the developmant of deep cavities possible. Due to much higher equilibrium of p_{CO2} in the soil and subsoil air and water (with mineralisation up to 180/220mg $CaCO_3$+$MgCO_3$/l) in the lower Slovene karst areas) the dripstone/solution divide is mostly in the upper metres and tens of metres. There the deeper cavities, generated in the cold quaternary peroids, are mostly in the stage of filling up with soil, loam, clay and flowstone. In the corrosion zone the development of voids(cavities) is mostly connected with soil and loam accumulation. Analyses of the fullfield and in the walls of the active quarries disclosed voids reveald in some tens of metres deep endokarst locally very different and changeble processes of voids enlargement and their plombing. The depths of the corrosion/deposition divide is differentiated and changable. The main factors of change are: opening and closing the ways of water penetration due to the flowstone and clay accumulation and due to the opening and closing of fissures in rock as a resutt of tectonical ancd gravitational displacements of rocky blocks, closing of the fissures (voids) which connect the air in endokarst with the free atmosphere {it controls the mention equilibrium), general and local lowering of the karst surface and consequently deepening of the accumulatian zone, antropogenic deforestation. The process cannected with allogenic and greater allochtonous water flows is speciphic and controlled by the mentioned alterations indirectly only.

SHAFTS

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There is no exact meaning of the term shaft. Shafts can be either vertical entrances to underground, vertical cave galleries or karst voids, which depth is larger than horizontal length. Shaft is not a genetic nor entirely morphologic term. It marks those karst caverns with one dimension emphasised, namely the vertical one.
Review of different types of shafts from Classical kras, history of explorations and different use of shafts is described.
Genetically, the shafts are of different origin. Three main types may be distinguished. The ones formed by percolating water, shaft formed by collapses of other types pre-existing caverns or shafts formed by waters mowing upward.
Shafts are important morphological unit of karst caves, and are form most common entrances into the caves. They are transmitters of water and air and surface debris into karst and often consist paleontological remains. In many shafts archaeological remains or traces of other human activity can be found also.

KARST PIPES PRESERVED IN THE TERTIARY LIMESTONES NEAR STASZOV, POLAND

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Many hundreds of solution pipes are exposed in quarriies near Stazsov, central Poland. The pipes are contained in Sarmatian (late-Miocene) carbonates of the Jaroslaw Formation and are filled with sediment derived from a Sanian (Mesopleistocene) till cover. The pipes average about $1m^3$ in volume though the largest are of order of $15m^3$. The average depth of pipes is cca 1.9m and the average diameter 0.6m. The host rock is riven by several sets of tensional master joints at close intervals but the field evidence is unequivocal that the structural fabric of the host rock had little, if any influence in determining pipe locus and form. These properties must lie in the nature of the interface between host and cover or, more probably, in the chemisry of the cover and/or the nature of hydrologic or cyrologic regime in which the pipes originated.There can be no doubt that the Stazsow piping paleokarst represents a covered karst system; it is postulated that it developed catastrophically and is the product of deglaciation and "depermafrostisation" at the end of the Sanian cold period.

A CLASSIFICATION OF THE SUBTERRANEAN ENVIRONMENT AND CAVE FAUNA

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Disclosure of Proteus anguinus, which is the largest cave animal in Europe was followed in nineteen century with discoveries and descriptions of many cave invertebrate taksons, new for science. Most of them are endemits, that means very locally dispersed.

The subterranean environment is directly related to the exterior as we have seen by means of fissures, cervices and ducts, so it is under direct influence of the regional micro climate. There are few principles witch govern the meteorology of caverns. These are low and constant temperature, permanent darkness, high humidity and usually lack of nutrients or prey. The responses given by the subterranean animals are very different although the environmental conditions are uniform in every specific micro habitat. A certain trend of features can be found, like depigmentation, loss of eyes, metabolic economy, increase in tactile sensitiveness, predominance of K strategy and others.
It is very difficult to list them as cave species with certainty. For many of reputed cave taxae their presence in surface habitats (particularly in soil) is very likely although not yet proved. It is accepted division of underground environment to aquatic and terrestrial subterranean environment. The most used classification of underground animals is on false cave-dwellers, which are occasional guests in the caves and on the true cave-dwellers. The last one we usually divide on: troglobiontes which are totally specialised to this lifestyle, troglophiles, which are moved into the caves by meteorological factors and can be found outside too. The third group are trogloxenes, which voluntary penetrate into the underground environment for its trophism and are incapable of breeding in this environment.
In Slovene caves we can find troglobiont represents of diverse animal groups as gastropods, worms, crustaceans, arachnids, myriapods and insects, specially beetles.
Even some species of vertebrates, like fishes, birds, rodents, carnivores and bats occasionally penetrate caves, cervices and shafts, but they are with exception of Proteus anguineus not adapted to troglobiotic lifestyle.

THE CAVES IN THE MOTORWAY DANE - FERNETIČI

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During the construction of motorway over the (Classical) Karst several fossil caves and shafts were discovered. Fossil caves, that are either void or filled up by fine-grained sediments or rubble provide useful indication of early stages of of this part of the aquifer development. Kras is very cavernous. During the construction and later use of the motorway the pollution of the groundwater must be prevented; an important danger presents subsidence-prone land due to thin ceilings above the caves.

VERTICAL SHAFTS - SOME HISTORICAL AND THEORETICAL REMARCS

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Vertical shafts are perhaps the most frequent cave objects. There is little doubt that they drain local precipitation water but their very function has not been completely cleared up yet. Some authors interpret them as direct continuation of surface streaming while others view them as underground collectors. Among vertical shafts, as understood by cavers, there are a number of vertical /steep fragments of phreatic systems which are generally neglected in theory. The aim of the paper is to clear up differences between these accesses.

CONCENTRATED AND DISPERSED POLLUTION OF CARBONATE AQUIFERS IN CRACOW-CZESTOCHOWA UPLAND IN THE LIGHT OF SPRING CHEMOGRAPH ANALYSIS

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Groundwater recharge, flow and subsurface water storage can be extremely variable in carbonate aquifers. Recharge can range along a continuum from concentrated to dispersed as a result of different degree of karstification. This paper outlines the results of an investigation of polution in different aspects of carbonate aquifer recharge. Variability of water temperature and mayor ion concentration has been monitored for several karst springs in the Cracow-Czestohowa Upland.
The model of karst spring chemograph in the international literature is discussed.The traditional model of thawing recharge in temperate karst areas and human impact in cold temperate climatics is rewieved and modified. The thaw effect and polution impulses are shown in the water chemistry by significant increase of calcium, sulphate and nitrate contents, the total hardness and the conductivity of soil water, epicarst and spring water recharge duiring the maximum of melt. Thees phenomena are acompanied by a low content of bicarbonates. Calcium concentration and total hardness in thaw water discharge are more related to sulphates and nitrates from pollutin than to dissolution effects in the system $CaCO_3$-H_2O-CO_2. Examples from several periods and storm flows for springs of diffrernt regimes are presented.

SHAFT GLACIERS IN THE CARPATIANS RANGE

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Taking a short account over the karstic areas repartition (Slovakia, Poland, Hungary,Serbia, Romania), we observe that the karst occurs over 1600 sq km in Romania and is followed by Slovakia with 1500 sq km.
Although shafts do not represent the main characteristic of Carpatian karstic landscapes, the most of underground glaciers are developed in shafts. The geographical repartition shows up that there are 10 ice and ice-snow accumulations in Romania, nine of them in vertical holes. In Slovakia there are 5 well known underground glaciers, 3 of them in caves and two in shafts.
The glaciers could be found at the altitudes between 500-2000m in forrested areas or in alpine zone. Temperate climatic as well as particular topo climatic with slope orientation, wind circulation and cave morfology are some of the genetic factors. Relict ice hypotesis is an interesting subject too.
Concerning their economical resource and scientific value a part of them are protected as show caves.

A COMPARISION OF RED SOILS FORMED FROM CALCAREOUS MATERIALS IN SOUTH AUSTRALIA AND JAPAN.

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The soils formed from calcareous sands dated as period from 4,300yr.B.P. to 69O,OOOyr.B.P. and the red soils above the Tertiary limestone were sampled in the southeastern part of South Australia. Climatic condition in the areas is typical Mediterranean climate. The calcite grain in the soils decreased dramatically by the age of sand dunes. But, Quartz grains in soils were rounded by the age. The iron activity in the soils decrease according to the age. On the contrary, the iron crystalinity increases by the age.
In the Nansei Island of Japan, the calcareous soils formed from uplifted coral reefs were compared with the soils in South Australia. The Nansei Island of Japan is under the influence of monsoon climate. The iron activity in the soils decreases according to the age. On the other hand, the iron crystalinity increases by the age. Both indices of iron in soils in South Australia and monsoonal conditions, the iron activity became extremely small during the same age. Under the wet and hot climate, free iron might be decrease rapidly by the age.

KARST DEPRESSIONS WITH PRECIPICED WALLS ON THE SOUTHERN SLOPE OF SNEŽNIK MT., SLOVENIA

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Snežnik is a high karst plateau; it has a dissected average elevation, the highest peak is 1796 m. Cone summits and large depressions among them represent karst morphology. On levelled areas there are numerous dolines, snow kettles and larger gently sloping dolines. The inclined limestone surface is etched by grooves. There are numerous caves, the shafts prevail. The Snežnik region consists of Jurassic and Cretaceous limestones and dolomites, yet there is also a lot of glacial and periglacial material.
Karst depressions with steep and precipiced walls are typical of the area of Ždrocle, in the south from the Snežnik summit at 1300 to 1400 m a.s.l. Snow that may stay all the year round is additionally reshaping their bottom. By aerial photography at scale 1:30.000 the location and shape of larger depressions was registered as well as main directions of tectonically crushed carbonate rocks. The most distinctive are Dinaric trending faults yet there are also transverse faults. Less distinctive, however traced by a series of depressions is N-S direction; the same trends were defined by mapping in the field. Three depressions with precipiced walls in the south from Andrejev studenec display the most prominent features. They developed in Lower Cretaceous limestones with dolomites and dolomitic breccias. The precipiced walls are controlled by fissured zone trending from N to S.