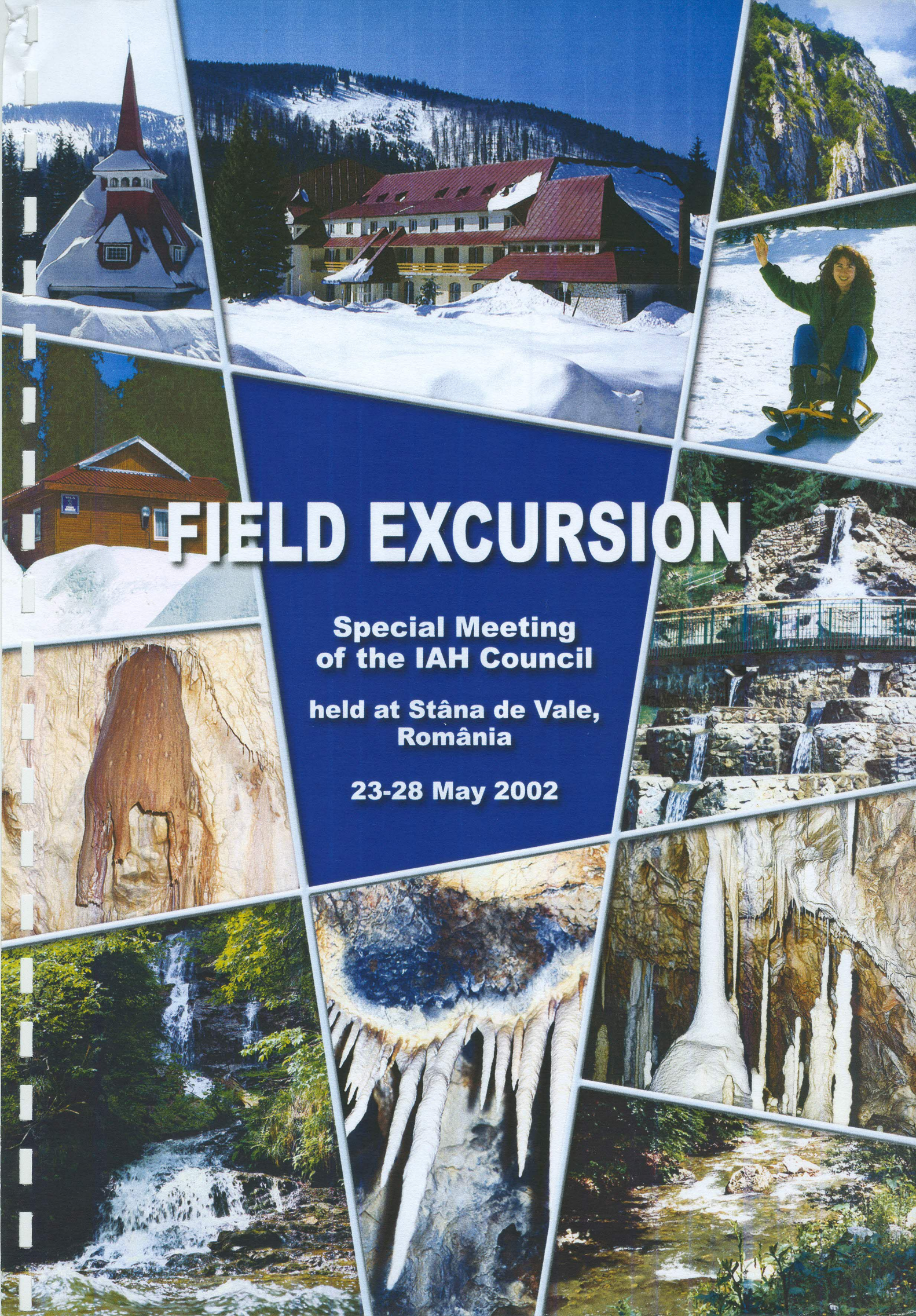

FIELD EXCURSION

Special Meeting of the IAH Council

held at Stâna de Vale, România

23-28 May 2002

ASOCIAȚIA HIDROGEOLOGILOR DIN ROMÂNIA
ASSOCIATION ROUMAINE DES HYDROGEOLOGUES
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Edited by *Romanian Association of Hydrogeologists*
Sponsored by *European Drinks*

CONTENTS

Contribution to the field guide:

Iancu ORĂȘEANU, PhD (field excursions 1 and 4);

Iancu ORĂȘEANU, PhD (field excursions 2 and 3)
Iosif VIEHMANN, PhD
Oana MOLDOVAN, PhD
Bogdan P. ONAC, PhD
Tudor TAMAȘ
Matei VREMIR

NOTE: Guide of field excursions 2 and 3 is a compilation of several texts and figures published by various authors either as independent articles or as a part of other field guides. A list of references used in this compilation is available at the end of this booklet.

Ebb and flow spring of Călugări

From the Oradea - Deva national road, in the center of Crisciorel locality, a non-asphalted road branches out on the right, which goes up to Izbuc and Călugări (Ponoarele). From the highest point of the road, a large view opens up on the karstic plateau Câmpeneasca, crossed by the Țarina stream. The first tracer-marking of an underground watercourse in Romania is tied to these places. In 1901, the Romanian geologist S.Mihuția, by labeling the water of Țarina stream with charcoal powder, outlined the hydrologic connection between Câmpeneasca cave (Photo. 2) in Vașcău karst plateau, and the spring Boiu next to Vașcău town (S. Mihuția, 1904).

Photo 3

Ebb and flow spring
at Călugări
in 1859 - 1861 period
(after A. Schmidl, 1864).

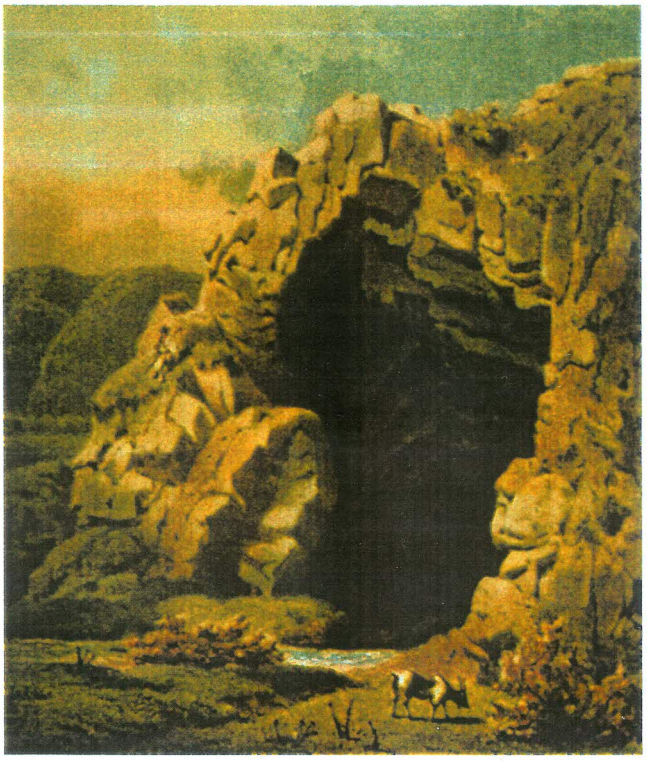


Photo 4

Câmpeneasa cave
in 1859 - 1861 period
(after A. Schmidl, 1864).

A sack of very fine charcoal powder was poured, on the 14th of August 1901, in the waters of Țarina stream, at 11 o'clock, at the entrance of Câmpeneasca cave. The tracer showed up in the water of Boiu spring after 3 hours (Figure 10). The author repeated the marking on the 23rd of August 1901, the transit time being now of 3 hours 14 minutes. The air distance between the cave and the spring is of 1780 m, and the level of the spring Boiu is 10 m lower then the base of the 25m waterfall in Câmpeneasca cave. The traveling velocity of the tracer was of 9 m/hour, so the author presumed that between the cave and the spring there is „a well-dug canal, with no obstacle in the water flow". In the same article, Mihuția presents a section between Câmpeneasca and Boiu, which proves a good knowledge of the geology and hydrology of the area. (Mihuția, 1904).

Carbonate deposits of Vașcău Plateau outcrop over a 90 km^2 area and consist of a stack whose thickness increases from West to East, reaching a value estimated to 2 500 m close to the town of Vașcău (Figure 9). The recharge of the aquifer accumulations occurring in these deposits is mostly derived directly from rainfall and, subordinately, from runoff on the non-karst hill slopes that adjoin the plateau collected in stream courses that, when they get into the karst area, they sink in the underground. Vașcău Plateau displays a compact closed drainage area that extends over 73.3 km^2, one of the largest in Romania.

In order to delineate the groundwater flow direction and their characteristics, 15 tracer tests have been performed in Vașcău Plateau. The tracer transit average apparent velocity (first arrival) was 81.4 m/hour (Orășeanu, 1985).

Most groundwater from the plateau discharges through Boiu spring (Fig.1, no.34). Tracer tests having been performed have shown that Boiu spring has its influence radius extended up to the southwestern part of Vașcău Plateau, from Câmpeneasca cave up to Ponoraș. (Fig.1 no.41) ponor, close to Zugau valley. The swallets which supply the karst system are situated 1.7-8.15 km away from Boiu outlet.

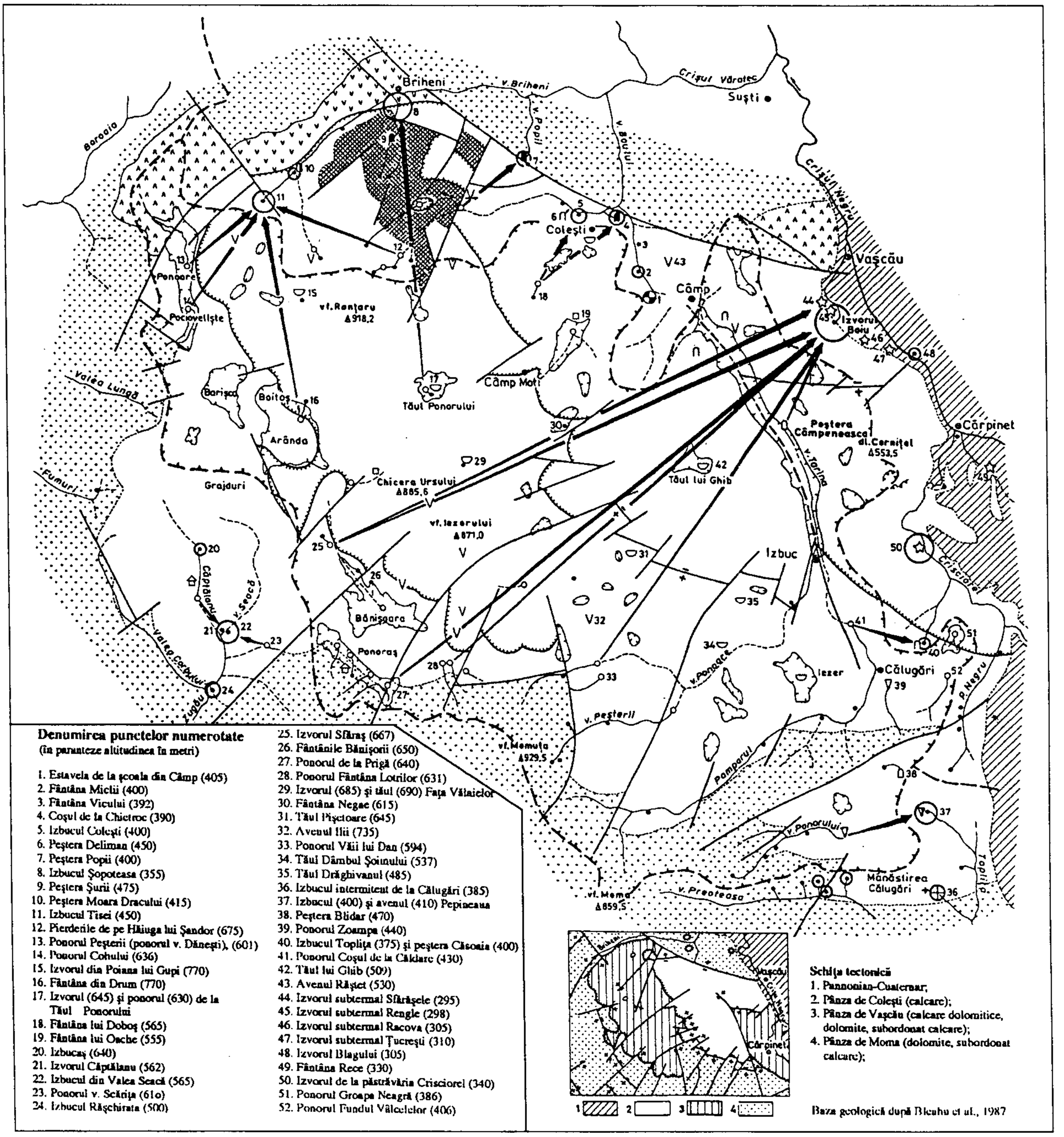
Over the hydrologic year October 1986 - September 1987, Boiu spring had an average flow rate of 0.588 m^3/s, ranging among the springs with the largest discharges in Apuseni Mountains. The extreme values of the spring flow rate, 0.069 and 6.0 m^3/s respectively, reveal an outstandingly high variability index (nv = 77).

Besides Boiu spring, water accumulations in the karst plateau, discharge through many other springs, among which the most important are: Șopoteasa (Fig.2, no.37; 0.214 m^3/s), Tisa (Fig.1, no.38; 0.326 m^3/s), the spring at Crisciorel Trout Hatchery (Fig.1, no.36; 0.289 m^3/s), Răștchirata (Fig.1, no.40; 0.040 m^3/s) and the spring in Valea Seacă (Fig.1, no.39; 0.050 m^3/s).

In the western part of Vașcău town, along the northwest-southeast striking fractures systems which are responsible for the progressive sinking of the Beiuș basin toward northeast, four hypothermal springs emerge from the early Triassic limestone of the plateau and from the Crișu Negru and Boiu streams alluvium: Sfărășele, Rengle, Racova and Țucrești. The temperatures range between 14.5 and 17.2 °C, the cumulated flow rate amounts to 15 l/s and they exhibit violent gas outflows. Also a series of cold springs display gas outflows: Blagu, Fântâna Rece and the spring at Crisciorel Trout Hatchery. A detailed study regarding the origin of these waters was published by I. Orășeanu and J. Mather in 2000.

After going through Izbuc and Călugări villages, there are three more kilometers to Izbuc Monastery, next to which there is the ebb and flow spring.

In 1863, geographer A.SCHMIDL publishes in Viena the work „Das Bihar Gebirge an der Grenze von Ungarn und Siebenburgen", the first ample speleology study on a zone in Romanian territory. It is by this work that the Izbuc at Călugări enters the world geographical literature as an ebb and flow spring. The author presents both the results of personal observations made at the spring accompanied by a beautiful watercolor image



Denumirea punctelor numerotate
(în paranteze altitudinea în metri)

1. Estavela de la şcoala din Câmp (405)
2. Fântâna Miclii (400)
3. Fântâna Viculuí (392)
4. Coşul de la Chietroc (390)
5. Izbucul Coleşti (400)
6. Peştera Deliman (450)
7. Peştera Popii (400)
8. Izbucul Şopoteasa (355)
9. Peştera Şurii (475)
10. Peştera Moara Dracului (415)
11. Izbucul Tisei (450)
12. Pierderile de pe Hăiuga lui Şandor (675)
13. Ponorul Peşterii (ponorul v. Dăneşti), (601)
14. Ponorul Cohului (636)
15. Izvorul din Poiana lui Gupi (770)
16. Fântâna din Drum (770)
17. Izvorul (645) şi ponorul (630) de la Tăul Ponorului
18. Fântâna lui Doboş (565)
19. Fântâna lui Osche (555)
20. Izbucaş (640)
21. Izvorul Căptălanu (562)
22. Izbucul din Valea Seacă (565)
23. Ponorul v. Scăriţa (610)
24. Izbucul Răşchirata (500)
25. Izvorul Sfăraş (667)
26. Fântânile Bănişorii (650)
27. Ponorul de la Prigă (640)
28. Ponorul Fântâna Lotrilor (631)
29. Izvorul (685) şi tăul (690) Faţa Vălaicior
30. Fântâna Negae (615)
31. Tăul Pişcitoare (645)
32. Avenul Ilii (735)
33. Ponorul Văii lui Dan (594)
34. Tăul Dâmbul Şoimului (537)
35. Tăul Drăghivanul (485)
36. Izbucul intermitent de la Călugări (385)
37. Izbucul (400) şi avenul (410) Pepineaua
38. Peştera Blidar (470)
39. Ponorul Zoampa (440)
40. Izbucul Topliţa (375) şi peştera Căsoaia (400)
41. Ponorul Coşul de la Căldare (430)
42. Tăul lui Glib (509)
43. Avenul Răştet (530)
44. Izvorul subtermal Sfărăşele (295)
45. Izvorul subtermal Rengle (298)
46. Izvorul subtermal Racova (305)
47. Izvorul subtermal Ţucreşti (310)
48. Izvorul Blagului (305)
49. Fântâna Rece (330)
50. Izvorul de la păstrăvăria Crisciorel (340)
51. Ponorul Groapa Neagră (386)
52. Ponorul Fundul Văilor (406)

Figure 9. Hydrogeological map of Vaşcău Plateau (after I. Orăşeanu, 1985).

of the spring (Photo 3), and the results of previous observations made by VASARHELY (1822), MEDVE (1823), WASTLER (1859) and CSAPLOVICS (1861).

VASARHELY (1822) says that „the local people use the water as a healing force, it fills the basin in 2 minutes 30 seconds, up to 1.5 feet (about 50 buckets). After that, the water went fast back, and in 16 minutes it came and went back again. Than there was one hour with no water."

Besides the up-mentioned researchers, CSAPLOVICS (1861), G.PETHO (1896), SIEGMETH (1899), S.MIHUTIA (1904), I.AL.MAXIM (1942) also wrote about the ebb and flow spring. After the period of their visit to the spring, the authors mentioned either the existence of large oscillations of the water in „Puţul de Piatră" (the Stone Pit) and the laps of time between them, or the immobility of the water surface at its bottom. The observations are made in very short intervals of time, usually in summer, the published data being very non-homogenous. But they provide important information regarding the periods in which the ebb and flow spring was active.

I.AL.MAXIM, in 1942, is the first researcher that proposes a template of the spring functioning. The template is based on the siphoning principle described by DARCY and the observations performed on the spring functioning by PETHO (the 14th and 15th of August 1892) and, partially, by SCHMIDL (1st of September 1861), observations that he generalizes. From these data, MAXIM found out (?) "a grouping of the flows , i.e.: a) after two flows succeeding at short intervals, there is no flow but after a long pause; b) the long pause between the two flows is interspersed by another flow; and the second short flow oscillates in time". This functioning of the ebb and flow spring is explained by the presence of a „double siphoning, that means it has two grottos of water storage: one smaller, down, and one bigger, up.

Călugări ebb and flow spring emerges from Anisian Dolomites, at their contact with the underlying Werfenian sandstones. The spring water gushes out from a karst conduit about 50 cm in diameter, occurring at the bottom of an irregular excavation, that develops over a 1 x 3 m area and reaches 1 m in depth, called Puțul de Piatră (the Stone Pit) (Photo 4, 5, 6 and 7).

In the perimeter of the ebb and flow spring, between 1980 and 1985, two basins were dug for collecting the waters. The action proved to be uninspired, as the diggings lead to the apparition of parasite springs situated 1-2 m under the level of the main spring, permanent springs that discharge the same aquifer.

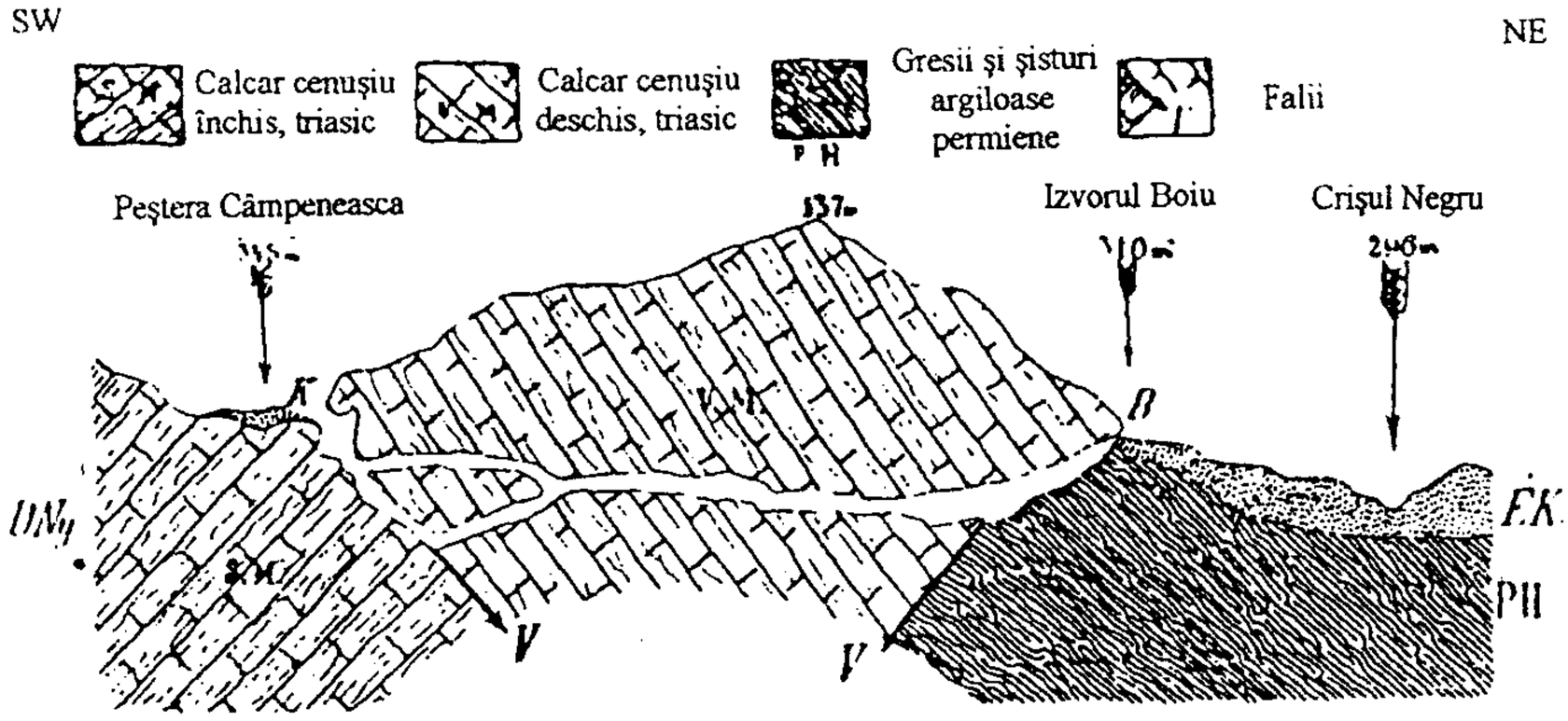


Figure 10.

Cross section between Câmpeneasca cave and Boiu spring

(after Mihuția, 1904).

Systematic hydrologic records, started in 1986, outlined that over a one year time span water oscillations in Puțul de Piatră occur in various ways, directly related to the spring flow rate. At flow rates ranging between 10 - 2.5 l/s, water level fluctuations occur as 60 - 80 cm amplitude **large oscillations**, of 9 - 13 minutes period and with about 1:6 ratio between the duration of the water level increase and that of the decrease, with water undergoing overflow past a threshold. Then, while the flow rate decreases below 2.5 l/s, water overflow from Putul de Piatra stops, the amplitude of the large oscillations progressively decreases with simultaneous development of small oscillations on their ascending and descending slopes. As the flow rate continues to drop, there occur only the **small oscillations**, with a 1.5 - 3 minutes ebb and flow period and with their amplitudes progressively decreasing from 7 cm to complete vanishing. Further on, the spring regime exhibits a progressively decreasing from 7 cm to complete vanishing. Further on, the spring regime exhibits a new expression, with **bell shaped oscillations** lasting about one hour and reaching 10 - 30 cm maximum amplitude, interposed with increasingly large periods, ranging from 2 to 20 hours, when the level is immobile (Fig. 11-18).

As a result of the heavy rainfall in the autumn of 1987, some 300 m away from the spring, there was declogged a steeply descending karst passage, pothole of Vulpii (Fox) Valley that reaches a cave chamber hosting a lake whose water level displays systematic oscillations with the same periodicity as those of ebb and flow spring. Hydraulic connection between underground lake and ebb and flow spring was proved also by tracer experiments.

All the data obtained in the observation period, which extends from 1986, with small interruptions, up to now, are being processed and will be published soon.

Photo 5 and 6

Stone Pit of Ebb and flow spring
at Călugări,
full and dry,
in the period of large oscillations
(28.04.2001)

Photo 7 and 8
Ebb and flow spring at Călugări, in the period of large oscillations (28.04.2001)

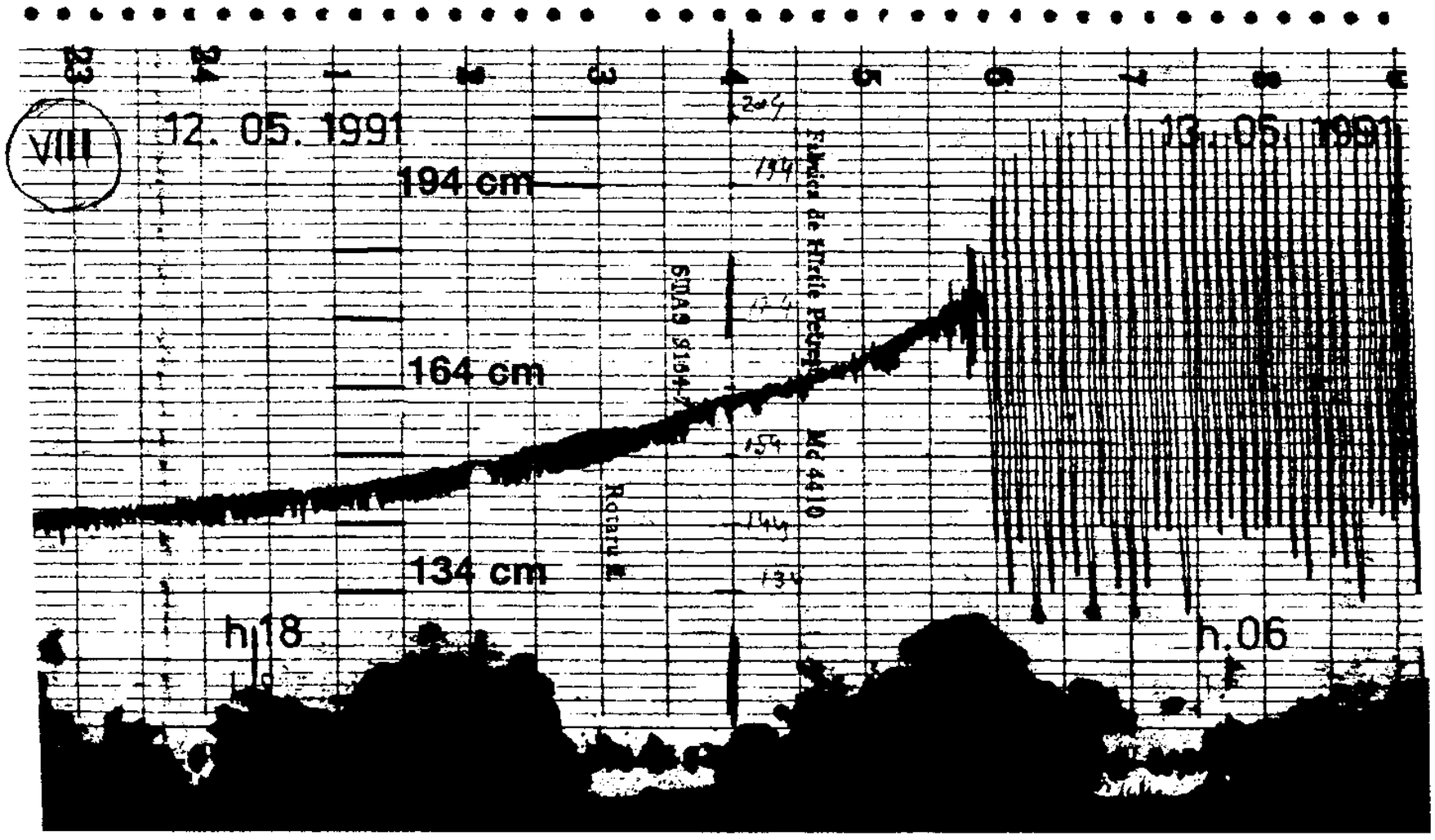


Figure 11.

Start of the large oscillation of the water level in the Stone Pit,

(12.05.1991)

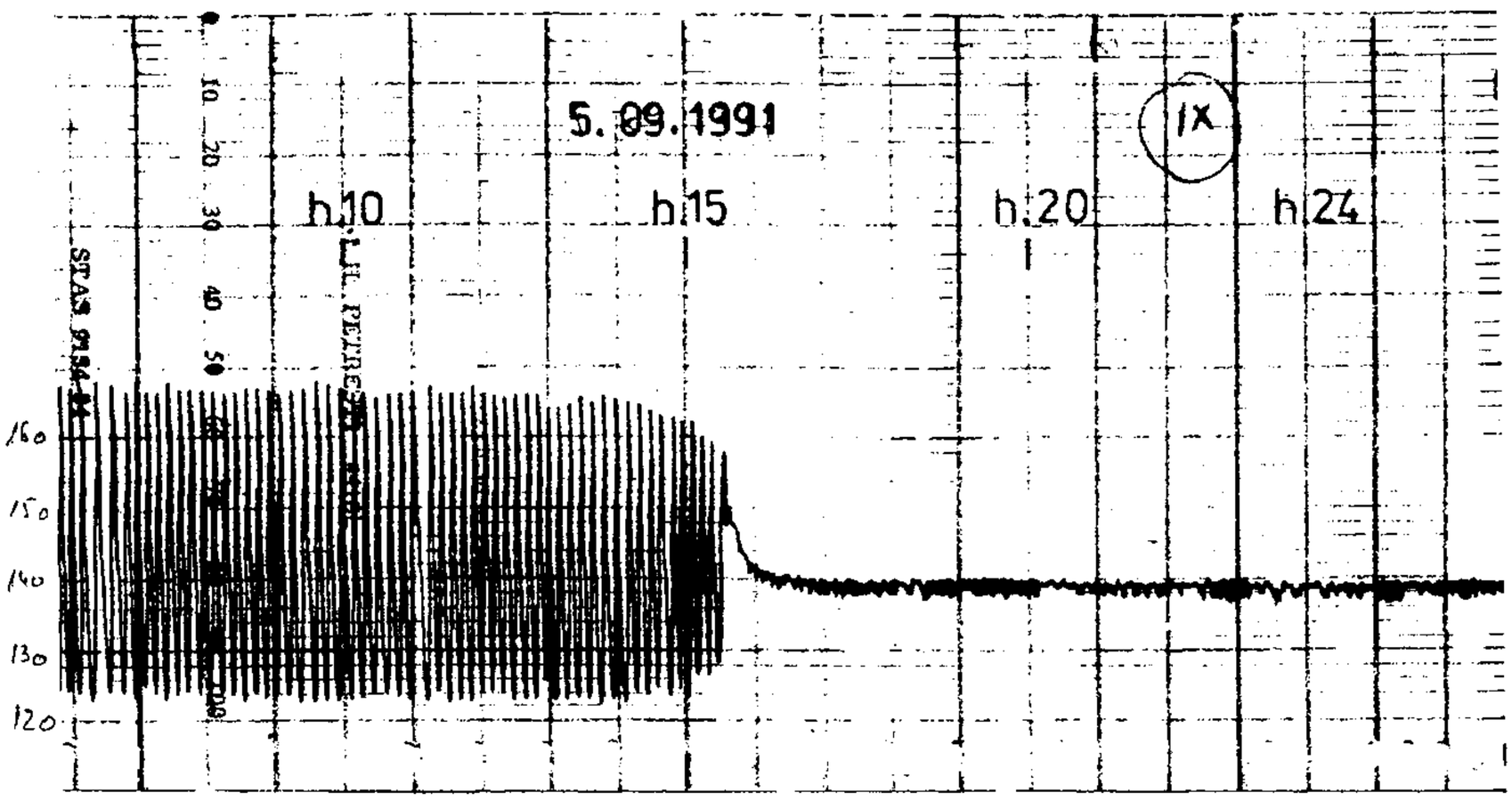


Figure 12.

Transitions between large oscillations to small oscillations of the water level in the Stone Pit

(05.09.1991)

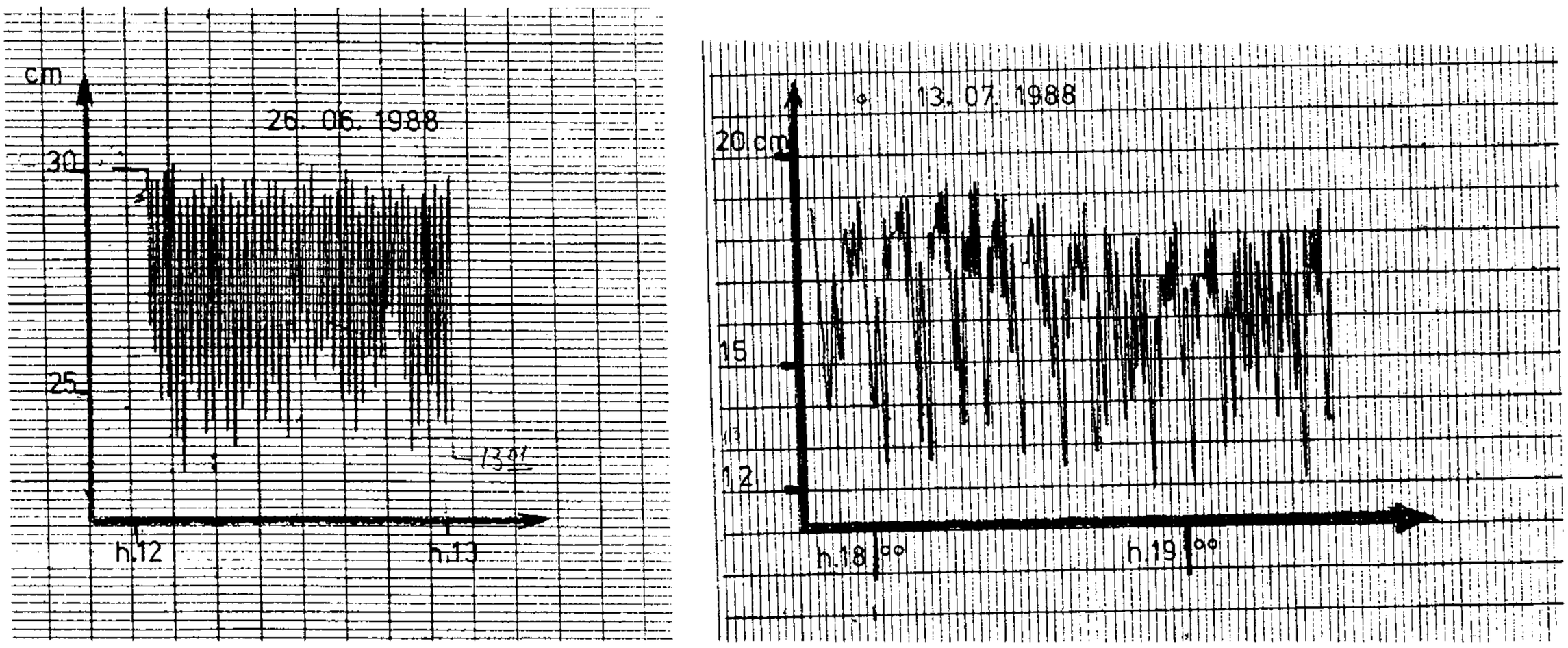


Figure 13.
Different shapes of small oscillations of the water level in the Stone Pit,
at 26.06.1988 and 13.07.1988

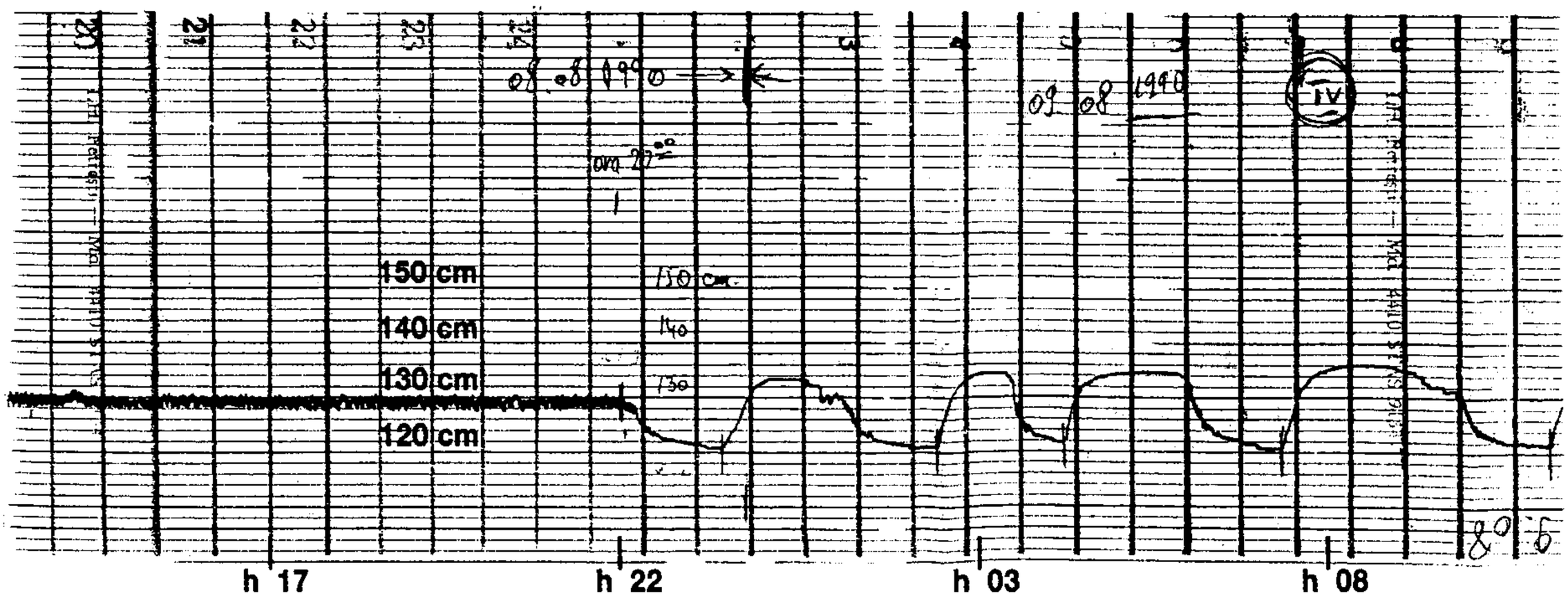


Figure 14.
Transition between small oscillations and bell shape oscillations of the water level in the Stone Pit,
in period: 08.08.1990 - 09.08.1990

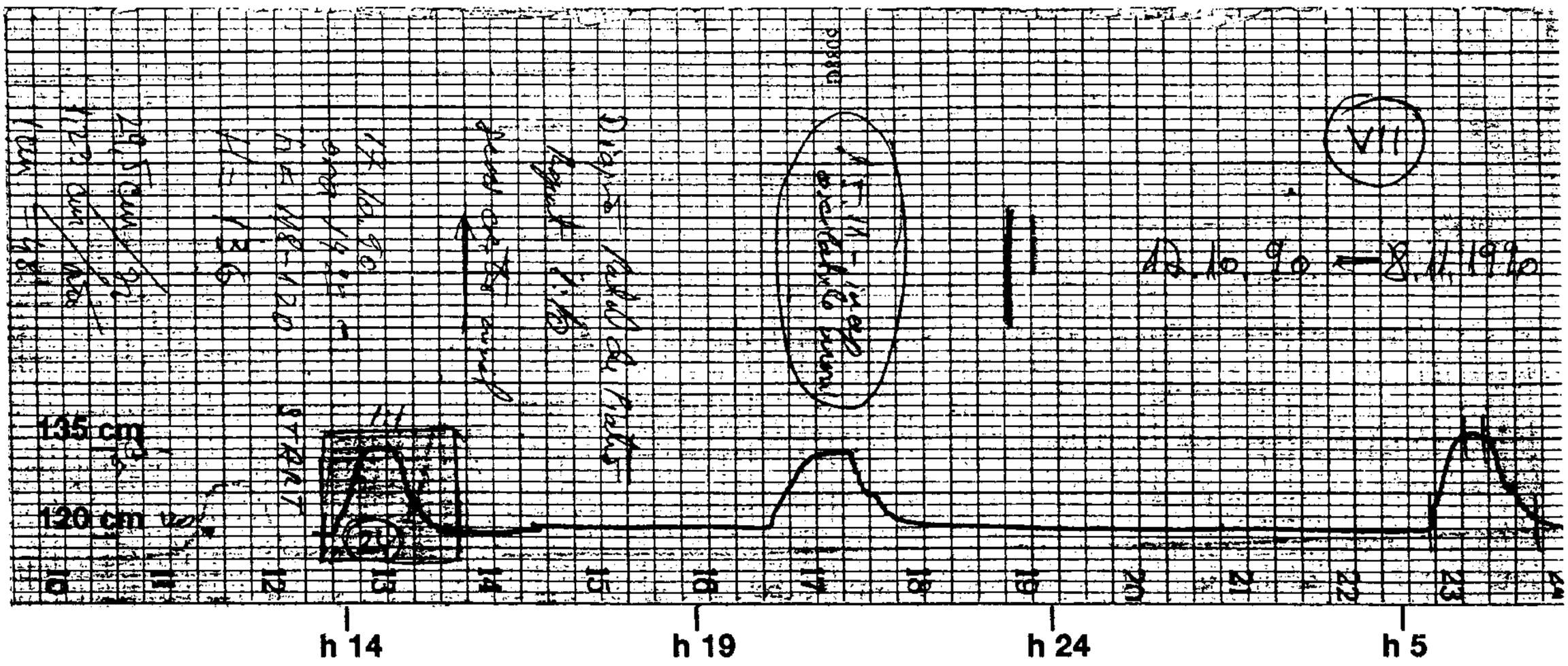


Figure 15.
Succession of bell shape oscillations of the water level in the Stone Pit,
in period: 17.10.1990 - 18.10.1990

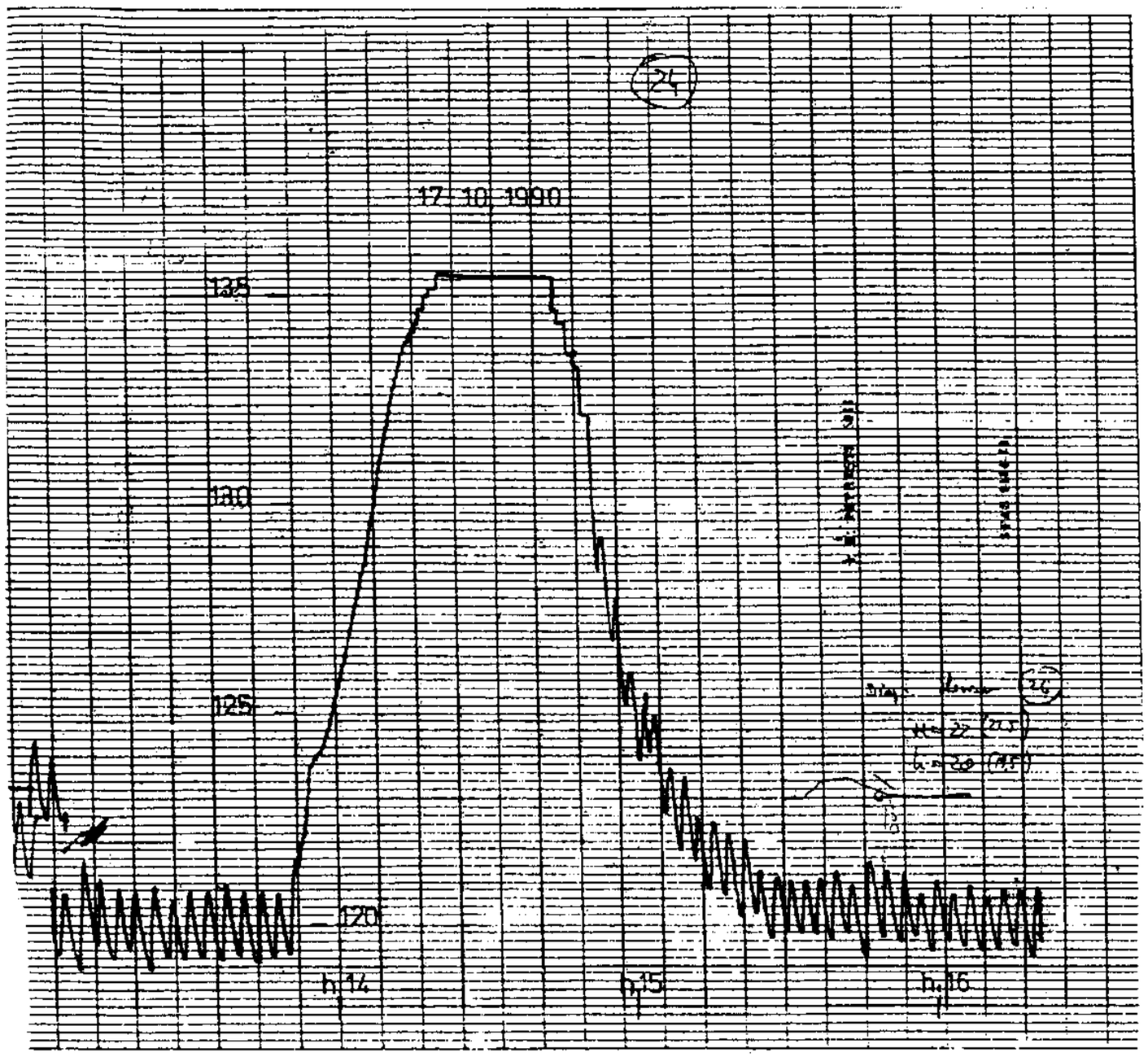


Figure 16.

Detail of the first bell shape oscillation
from figure 15.

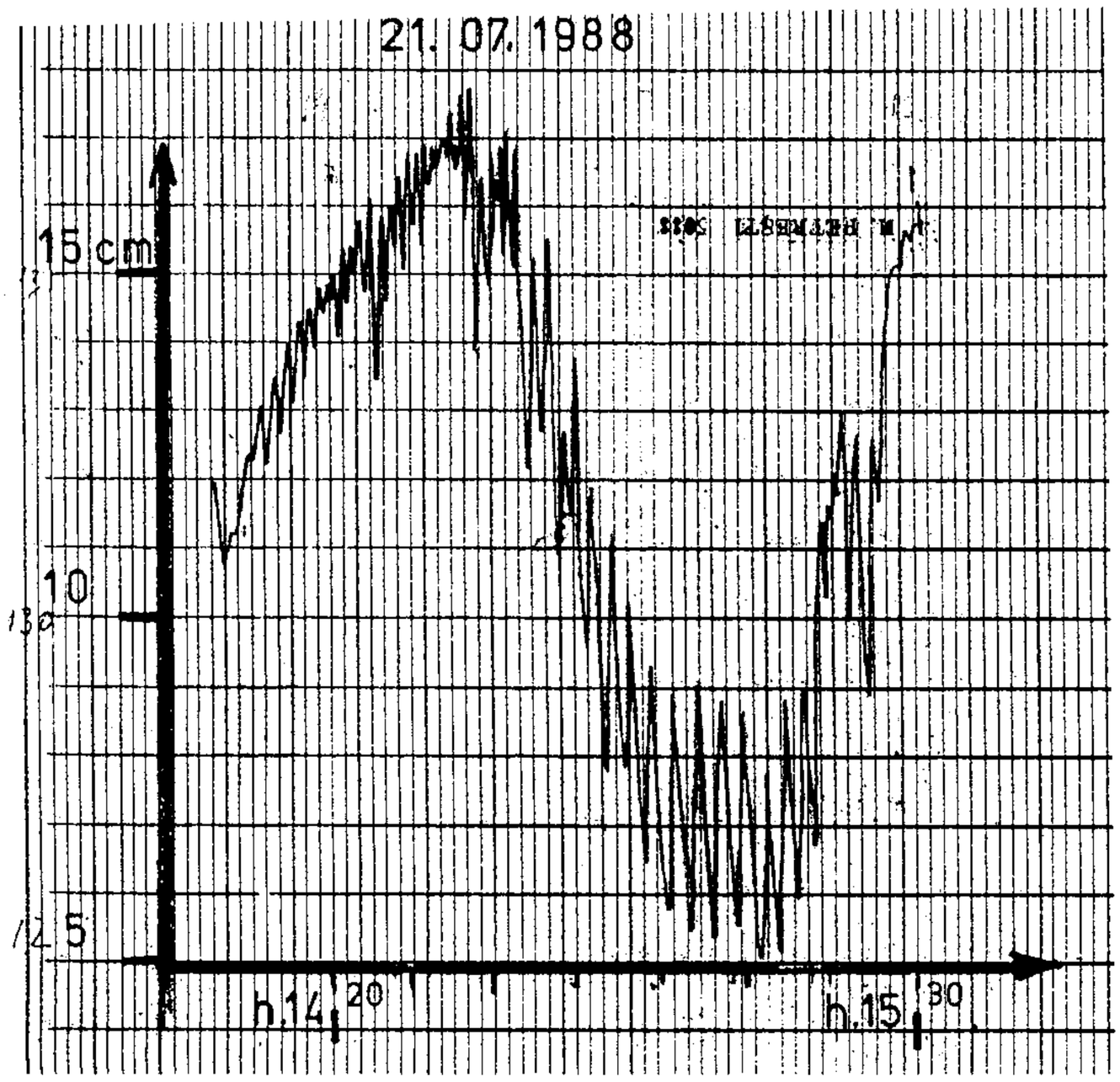
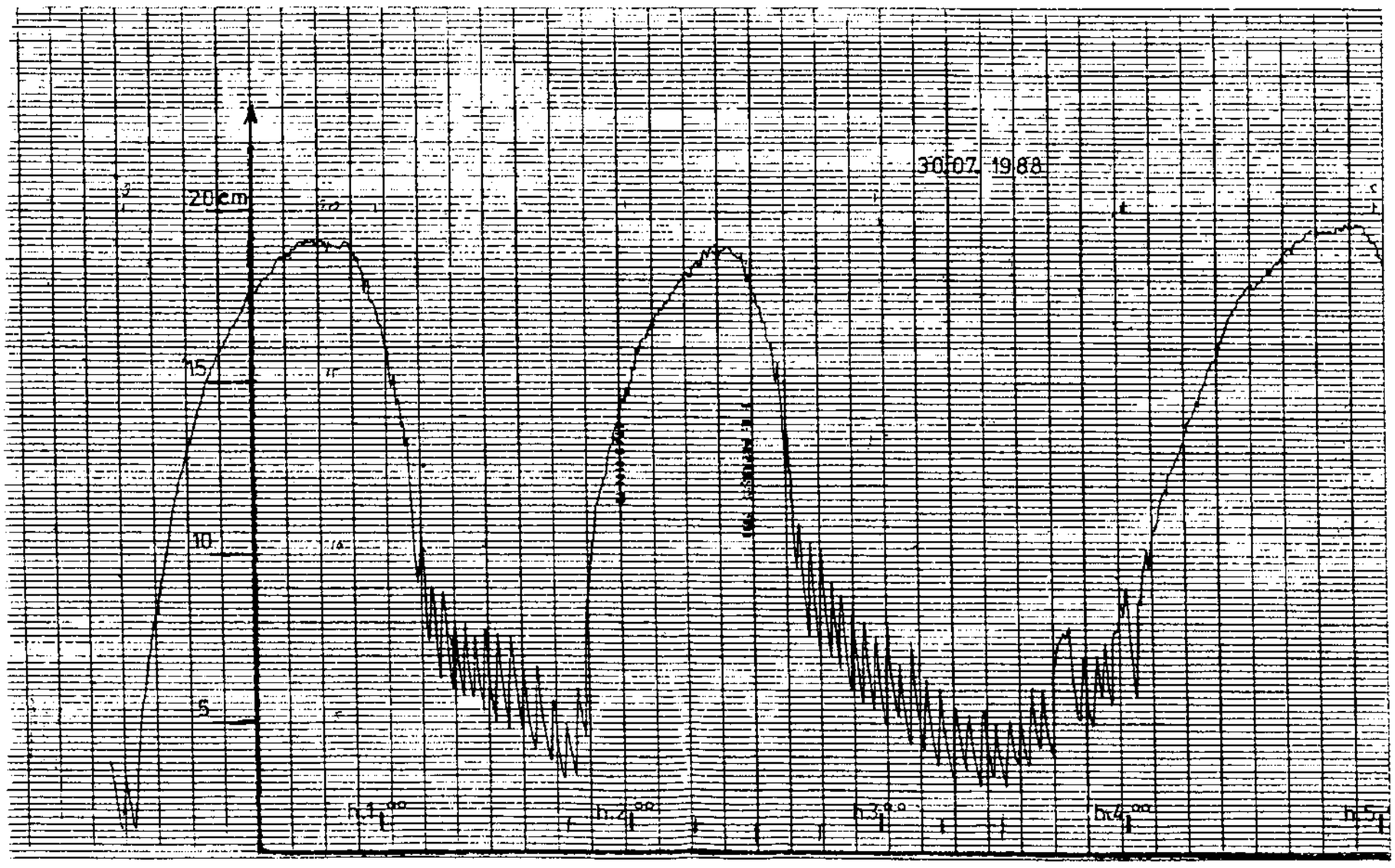


Figure 17.
Different bell shape oscillations



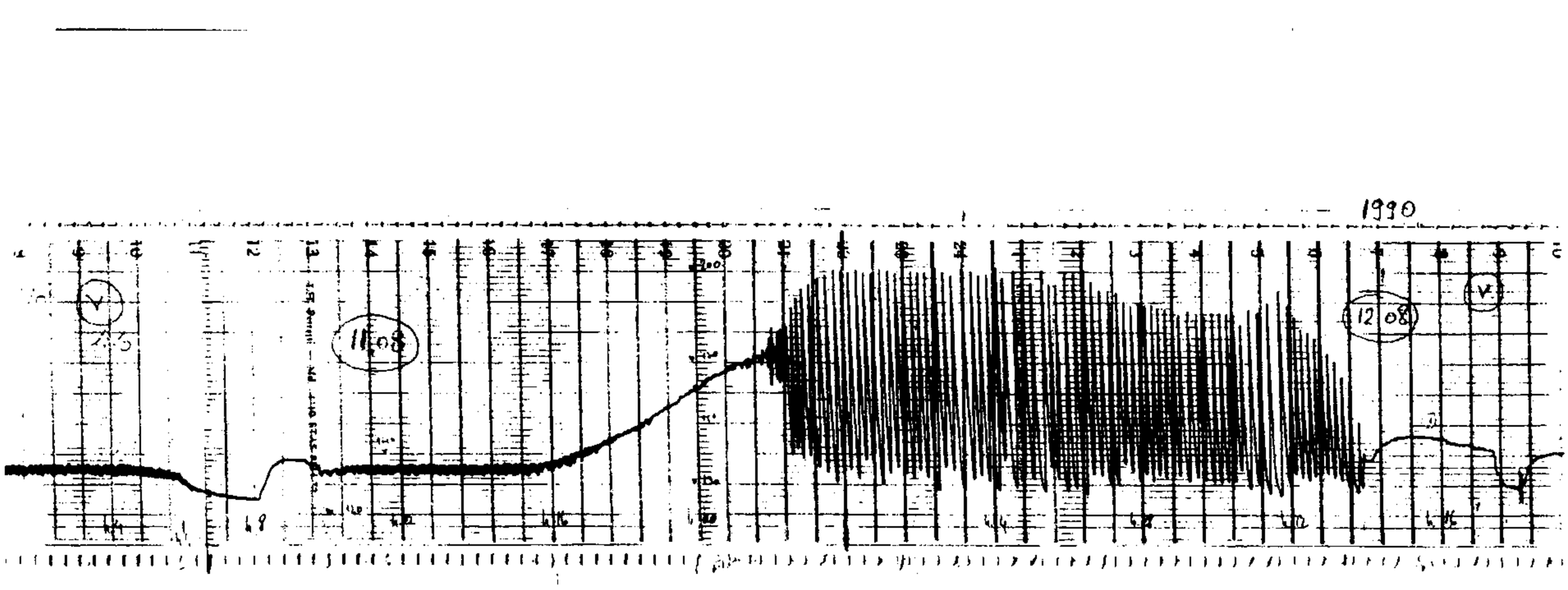


Figure 18
Succession of bell shape oscillations and small oscillations of the water level in the Stone Pit, interrupted by large oscillations, as results of the discharge spring increase in time period: 11.08.1990 - 12.08.1980

IZBUC MONASTERY

- SHORT HISTORY -

As an answer to the documented memorial of Roman Ciorogariu, the bishop of Oradea, the Holy Synod of the Romanian Orthodox Church approved, on the 28th of May 1928, the setting up of the Izbuc Monastery, its name being given on the ebb and flow spring next to the great now existing church.

The bishop entrusted the archpriest Athanasie Popescu with the organization of the monastic life, appointing him abbot of Izbuc Monastery. He proved to be a very good organizer and a true monk.

As a beginning of the construction, the abbot performed a blessing service on the place where the buildings were to be raised, on the 30th of April 1930, the Friday in the Holy Week, also named "The Spring of Healing", which also remained the name of the church. The church and the annex buildings were raised and hallowed on the 15th of August 1932, at the wake of the Mother of God.

In 1937 the abbot Athanasie retired and then the Second World War occurred, so the initial plans had to be abandoned.

Only in 1959, when the abbot was Ioanichie Popescu, the modest church raised by the former abbot was extended to the actual dimensions. In 1971, the painter Nicolae Popa of Cepari painted it in thick tempera.

In 1954, a bell tower was built on the hill in front of the church, and a small wooden church was brought from Beius and was rebuilt here.

With a new worthy abbot (Iorest Grebencea of the Putna Monastery) and financial support from the pilgrims and from the Bishopric, a new abbot place was built in 1985, a new two-stories building in 1987, then a new kitchen and a room for having meals. In the summer of 1989 a new chapel was built, to be used during winters.

The name of the spring - "the ebb and flow spring at Călugări", and the name of Călugări (Monks), first attested in 1859, that Ponoare village bore up to 1968, proves that in this place there was a very old monastic settlement, and recently discovered documents in the Archbishopric of Esztergom - Hungary show that there were orthodox Romanian monastic settlements in these places from as far as the 11th century.

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