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HYDROGEOLOGICAL STUDY OF PETRESTI (BACĂU COUNTY) AREA

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Abstract

In Petreşti area the oldest deposits are represented by grey marn clays with intermingles of cineritic sands green-grey, upon which loessoid deposits have been recorded. The water of studied springs comes from Pleistocen permeable deposits and the hydrogeological potential of Petresti basin corresponds to a flow of 5.4 l/s. Petresti source meets all the requirements to be economically exploited as a natural oligomineral, hydrogen-carbonated, magnesian and calcic water. The surroundings of the hydrogeological perimeter has no factors that could interfere with the quality of the water.

Keywords: hydrogeology, hydrogeological potential, water quality Bacău county

Localization

From the administrative point of view, the Petresti area belongs to Petresti village, Pincesti district, Bacau county, on the road between Pincesti and Parincea villages.

From the geographical point of view, the area is situated on the intersection of the coordinates $46^o23'$ N latitude and $27^o 07'$ E longitude (fig. 1).

Geomorphologically, the area belongs to Tutova de Sus platform, as a structural unit of Moldova Plateau.

In a smaller sense, the perimeter lies on the interflow between Nanesti Valley at W and Soci Valley at E, both those valleys almost coming together at N. The Southern wall is bordered by the field made up of the confluence between Racatau and Siret Valleys.

The interflow is known as Hamei Hill, with a maximum height of 304 m in Petresti peak. In this area there are kept segments from a wide rounded surface, as a result of lifting movements which have taken place in Cuaternar period.

From the hydrographical point of view, the study area discharges into Siret river. The two main water courses, mainly Nanesti Valley, as the last left afluent of Racatau Valley flows into Siret river at approximately 6 km up stream through Racaciuni accumulation and Soci Valley discharge into Siret river South-West from Pincesti area. Both valleys run from NNE-SSW, being relatively short and with torential afluents. The alimentation of the valleys is pluvionival, high flows of water being documented in the months of April-June. Hydrologically the area has the cadastral code XII-1.59.4.

The climate is temperate continental, with specific aspects, due to neighbouring of Siret couloir and water accumulations upstream and downstream from Pincesti. The temperature has a mean of 9°C and precipitations almost reach 600 mm per year.

According to those climate elements and ondulating relief, the vegetation consists mainly of leafy forests on the walls, as well as agricultural areas and lawns.

Geological data

As it is shown in figure 1, in the study area the oldest deposits are represented by grey marn clays with intermingles of cineritic sands green-grey poorly consolidated, Kersonian-Meotian aged. In the prospecting area those are well seen in the walls of Nanesti Valley between altitudes of 200-220 m as well as on the right wall of Soci Valley. Upon those, the loessoid deposits of Mid- and Superior Pleistocen are well represented ($Q_{p2} - Q_{p3}$) in altitudes between 230-280 m. On the walls of those valleys there are also terrace deposits of Mid Pleistocen, made up of sands mixed with gravel and rocks.

The youngest deposits of alluvionar origin have been identified in the meadows, consisting of rocks, sands and gravel with different granulosity, belonging to Holocen. (fig. 2).

Hydrogeological considerations

The prospecting and observation works made on the left flank of Hamei Hill have revealed on a length of 2 km between the level curves of 185 m and 240 m a series of spring discharges, some of theem poorly captured.

The water of those springs comes from Pleistocen permeable deposits, both in the high field situated over 245 m and to the terrace deposits between 185 m and 240 m, at the contact between the latter and the marn-clay bed.

It has also been shown that the sandy strata at the upper side of the marn-clay base are aquifers, due to the fact that they are suppplied by the NW ends, in the left flank of Nanesti Valley, the direction of the subterranean flow being NW-SE (fig. 2).

Through measurements upon some of the springs there have been determined flows of 0.15-6 l/s. The spring discharging on the property of S.C.''LOTUS'' S.A. is captured

by a horizontal coastal drain and it has a constant flow, measured at different intervals during 2002, of 0.5 l/s.

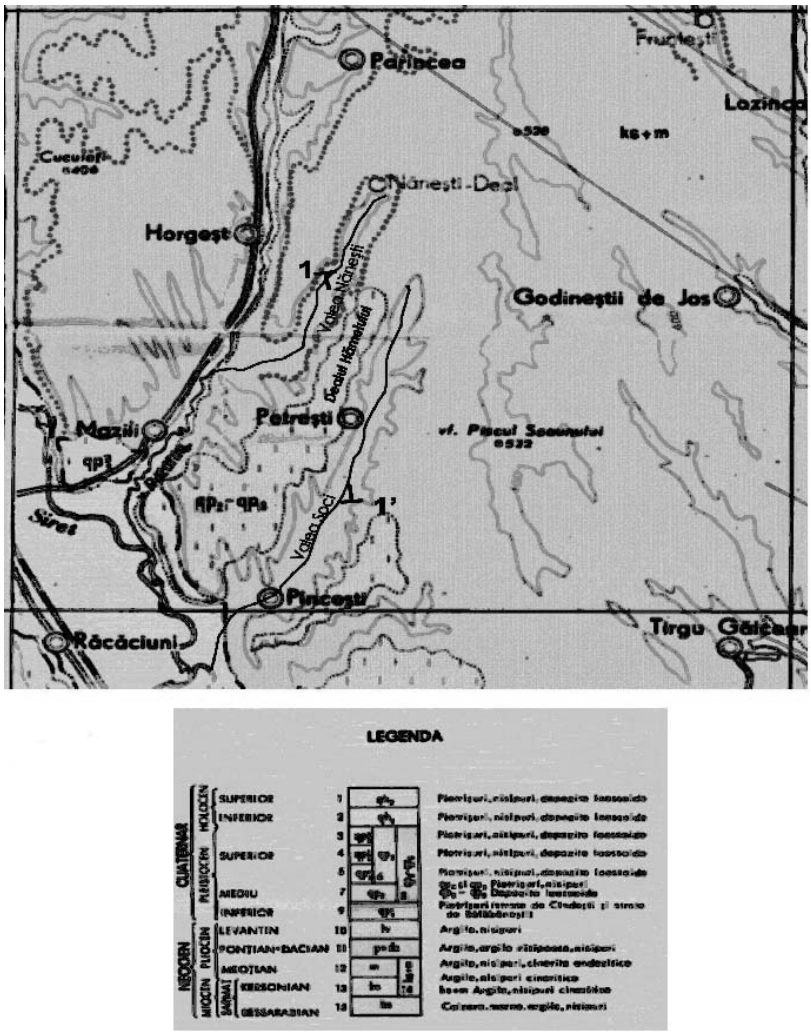

Fig. 1. Geological map of Petreşti area (from the Geological map of Romania, 1:200.000; 1968)

Evaluation of hydrogeological potential

For this purpose it has been used the calculation method of subterranian flow modules, due to its simplicity and relatively good results in such instances.

The captured flow from the subterranean of the study area by whole exploitation of the aquifer adjacent to the hydrogeological basin is given by:

$Q=q * A$, where:

q= module of subterranean flow ($l/s/km^2$);

A= surface of area adjacent to q (km^2).

The value of q, determined by analysis of natural conditions of the hydrogeological basin (Petresti), involving altitude, type of existing vegetation, permeability and terrain inclination, in our case is 1.8 $l/s/km^2$.

The surface of the hydrogeological basin of the Petresti source adjacent to q is 3 km^2.

Inputting those values in the above equation it is shown that resulting hydrogeological potential of Petresti basin corresponds to a flow of 5.4 l/s.

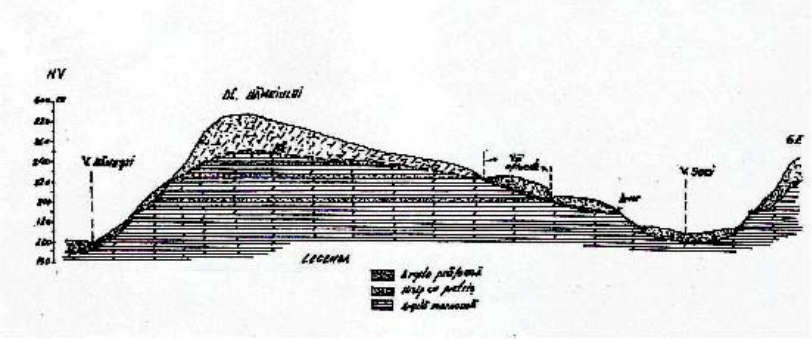

Fig. 2. Geological profile of Petreşti area 1-1' (from the Geological map of Romania, 1:200.000; 1968)

The quality of water

For the Spring No. 1 there have been made measurements of hydrogen ion concentration, with values of 7.47 (pH units), of the water temperature which is constantly 11°C and of the conductivity – 844 µS/cm.

To further analyze the qualities of the water from this source (Spring No. 1), there have been made complex physico-chemical analyses in the laboratories of the National Mineral Water Authority (S.N.A.M) Bucharest.

Main components' concentrations in equivalent units (me/l) and percentages, and also the salts' concentrations from stoechiometric calculations, shown in Plate 1, have led to following proportions of possible salts in this water:

$Mg(HCO_3)_2$ Magnesium bicarbonate - 40%

$Ca(HCO_3)_2$ Calcium bicarbonate - 33%

$NaHCO_3$ Sodium bicarbonate - 14%

NaCl Sodium chloride - 8%

SO_4Ca Calcium sulphate - 5%

It is thus shown the dominant character of bicarbonates (over 80%), within which magnesium bicarbonate holds an important proportion.

Conclusions

Considering the presented data, we appreciate that Petresti source meets all the requirements to be economically exploited as a natural oligomineral, hydrogen-carbonated, magnesian and calcic water.

The surroundings of the hydrogeological perimeter has no factors that could interfere with the quality of the water, this being another assurance for the purity of the present bottled and marketed product called PRIMA. Nowadays the source is protected within a surrounding delimited perimeter of 1000 m^2, which offers a high safety degree from the sanitary point of view.

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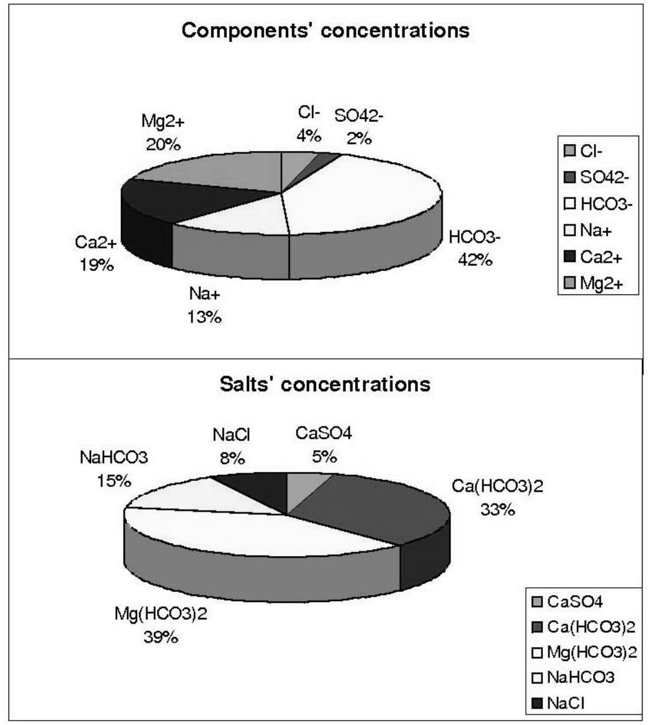
Plate 1



Components	Concentration
	me/l
Cl^-	0,78
SO_4^{2-}	0,47
HCO_3^-	8,79
Na^+	2,6
Ca^{2+}	3,8
Mg^{2+}	4

Salts	Concentration
	me/l
$CaSO_4$	0,47
$Ca(HCO_3)_2$	3,33
$Mg(HCO_3)_2$	4
$NaHCO_3$	1,46
NaCl	0,78