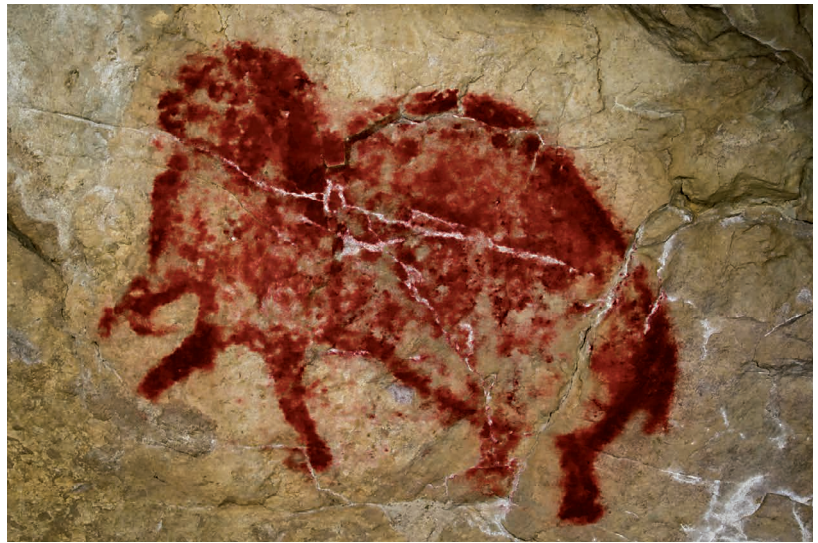


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# HISTORICAL WATER QUALITY DATA FROM CERNA VALLEY / BAILE HERCULANE – ROMANIA

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## 1. Geographical settings

Baile Herculane is located in the Cerna Valley in the South-western part of Romania, near the border with Serbia. Thirty-one thermal springs and wells are near the Cerna River as a result of a geothermal anomaly developed along a narrow graben (Simion et al. 1979).

## 2. History

In late 1970s the Romanian government began the construction of a hydro-power system on the Cerna-Motru-Tismana. On each of those rivers, including their main tributaries, dams were built and the waters from Cerna Lake were funnelled through tunnels to Motru Lake and then to Tismana Lake, where the power station is located (Ponta et al. 2006, 2013).



Figure 1. Hygeia Spring.

The volume of water in the recharge area for the thermal water reservoir was substantially diminished. A study was requested by the government, to determine the effects of water withdrawal from the Cerna River on the thermal water reservoir and to evaluate potential hydrogeologic connections between the Cerna River, its tributaries, and thermal water reservoirs. The project was conducted by the Intreprinderea Geologica de Prospectiuni pentru Substante Minerale Solide/Geological and Geophysical Prospecting Company (I.G.P.S.M.S.), Romania (Ponta et al. 2006).

## 3. Water sampling and results

The activities related to this study included a karst inventory, dye studies and water sampling. The results of the water samples collected in the sixties and seventies from thirty-one springs (Figures 1 and 2) and wells located along the Cerna Valley are presented in Table 1. The period of

record varies for each station; the springs and wells located in the Baile Herculane area were

sampled with the same frequency. The table represents the most comprehensive data set available for that period of time. The location of the sampling points is shown on Figure 2.



Figure 2. Neptun (right) and Venera Springs (left in the Cerna River).

To comply with the congress publication guidelines, only a shorter version of the table is part of this article. The digital version of the proceedings includes the complete table as shown in the 1979 report.

The paper provides previously unpublished water quality data for the thermal water reservoir at Baile Herculane. This data, collected in the 1960s and 1970s, is now available for use by students and researchers working in the area.

## References

- Ponta G, Terteleac N, 2006. Geology and Dynamics of Underground Waters in Jiul de Vest – Cerna Valley, Băile Herculane (Romania). Archives of Climate Change in Karst, Special Publication 10, Proceedings of the Symposium Climate Change: The Karst Record (IV), 227–230.
- Ponta G, Povară I, Isverceanu EG, Onac BP, Marin C, Tudorache A, 2013. Geology and dynamics of underground waters in Cerna Valley/Baile Herculane (Romania), Carbonates and Evaporites DOI 10.1007/s13146-013-0149-2.
- Simion G, Terteleac N, Ponta G, 1979. Raport Asupra Studiilor Hidrogeologice Efectuate în Carstul Văii Cerna, în Vederea Stabilirii Influenței Complexului Hidroenergetic Cerna-Motru-Tismana, asupra Zăcămintului de Ape Termominerale de la Băile Herculane, Județul Caraș-Severin, Report. IGPSMS Archive.

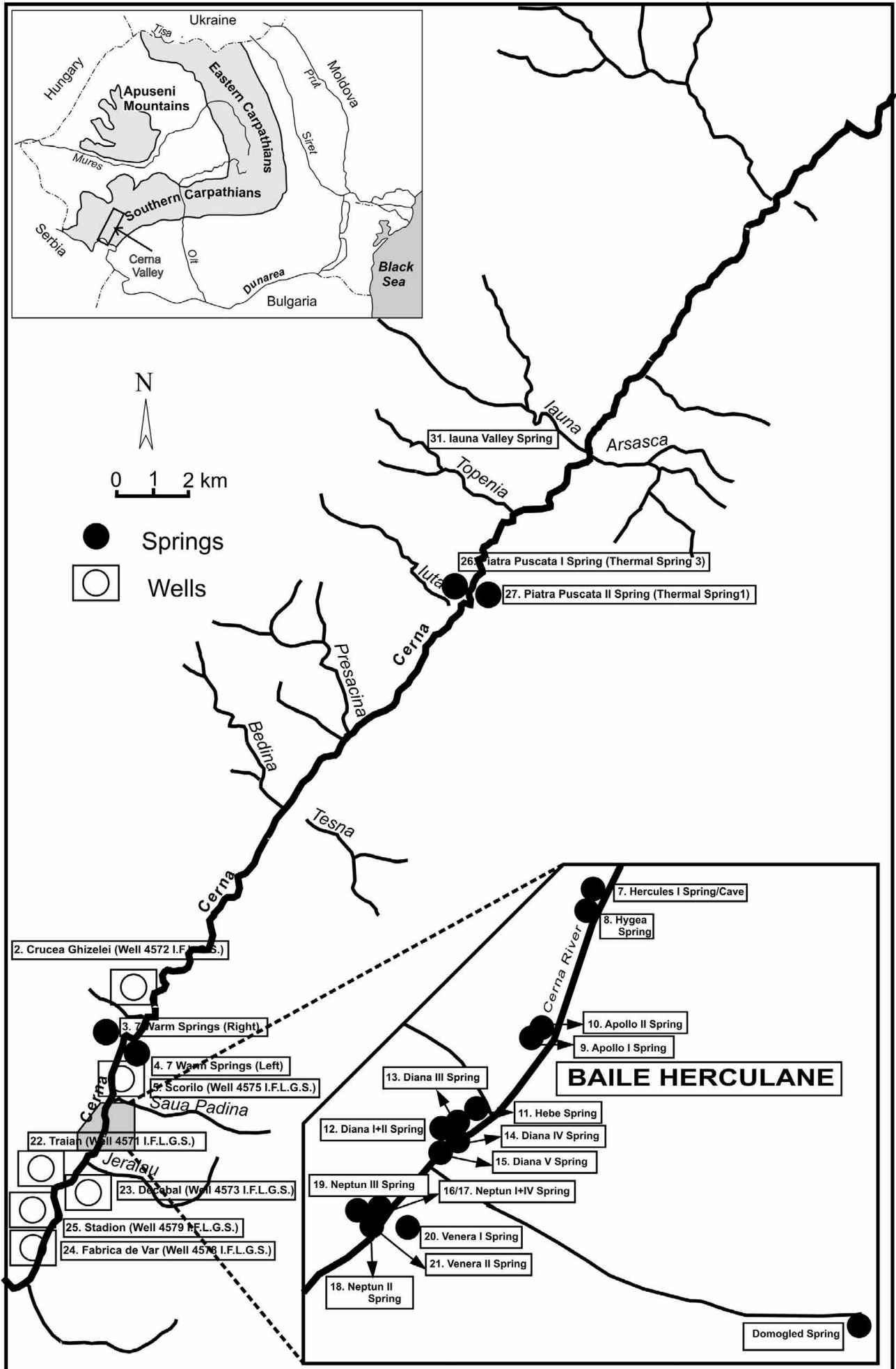


Figure 3. Location of the study is within the Baile Herculane/Cerna Valley, Romania.

Table 1. Summary of Water Quality Data in Cerna Valley – Baile Herculane, Romania.

NO	LOCATION	COMPANY COLLECTED WATER SAMPLES	DATE	ANIONS							CATIONS					
				Cl <sub>2</sub>	Br	I	NO <sub>2</sub>	SO <sub>4</sub>	HCO <sub>3</sub>	Na	K	NH <sub>4</sub>	Ca	Mg	Fe	
				mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
1	Valea Slatinic*	I.G.P.S.M.S.	June 1978	177.00	ND	ND	ND	288.00	122.00	260.00	7.00	ND	296.00	ND	0.30	
			October 1978	177.00	ND	ND	ND	109.00	61.00	163.00	5.00	ND	20.00	ND	0.30	
			December 1978	166.00	ND	ND	ND	124.50	85.40	168.00	5.00	1.00	24.00	ND	0.10	
			1969	7.00	ND	ND	ND	1.00	244.00	13.00	ND	ND	37.00	21.00	ND	
			1974	7.00	ND	ND	ND	7.00	244.00	7.00	0.60	ND	55.00	15.00	0.10	
2	Crucea Ghizelei (Well 4572 I.F.L.G.S.)	I.G.P.S.M.S.	1976	7.00	ND	ND	ND	9.00	256.00	3.00	0.80	ND	53.00	21.00	0.10	
			1977	7.00	ND	ND	ND	ND	219.00	5.00	0.40	ND	53.00	10.00	0.10	
			1977	7.00	ND	ND	ND	3.80	305.00	1.60	0.20	ND	63.30	25.00	0.15	
			June 1978	10.00	ND	ND	ND	ND	244.00	4.50	0.80	ND	58.00	14.00	0.20	
			November 1978	7.10	ND	ND	ND	2.90	225.00	5.00	0.40	ND	53.00	15.00	0.20	
			December 1978	14.00	ND	ND	ND	1.90	219.00	5.00	1.10	1.00	57.00	10.20	0.10	
			August 1979	14.00	ND	ND	ND	7.70	305.00	6.00	ND	ND	68.00	13.00	0.20	
			1974	205.00	ND	ND	ND	120.00	97.00	198.00	6.00	ND	21.00	ND	0.10	
			1976	198.00	ND	ND	ND	120.00	122.00	191.00	9.00	ND	30.00	ND	0.10	
			1977	170.00	ND	ND	ND	109.00	73.00	174.00	6.00	ND	10.00	ND	1.00	
3	Spring I	I.G.P.S.M.S.	1977	184.00	ND	0.10	ND	98.00	122.00	179.30	6.00	5.00	20.80	ND	0.20	
			June 1978	177.00	ND	ND	ND	211.00	73.00	201.00	7.00	ND	32.00	ND	0.30	
			November 1978	184.00	ND	ND	ND	175.00	97.00	161.00	3.90	ND	29.00	5.00	0.20	
			December 1978	173.00	ND	ND	ND	119.00	85.40	165.00	5.00	1.00	27.00	ND	ND	
			August 1979	191.00	ND	ND	ND	99.00	170.80	172.30	9.00	15.00	40.00	ND	0.20	
	Spring II	I.G.P.S.M.S.	November 1979	170.20	ND	ND	0.40	161.30	97.70	155.50	6.00	1.00	38.80	ND	0.10	
			1961	175.00	0.20	ND	ND	101.00	85.00	158.00	12.00	ND	17.00	4.00	0.20	
			1974	170.00	ND	ND	ND	119.00	48.00	163.00	7.00	ND	16.00	ND	1.00	
			1976	205.00	ND	ND	0.10	144.00	97.00	222.00	7.00	ND	30.20	ND	0.20	
			1977	184.00	ND	ND	ND	109.00	61.00	180.00	6.00	ND	9.00	ND	0.10	
			1977	184.00	ND	0.10	ND	103.00	73.00	166.00	5.00	ND	23.20	ND	0.20	
			June 1978	184.00	0.50	ND	ND	103.00	73.00	167.00	4.00	ND	21.60	0.90	0.30	
			November 1978	198.00	ND	ND	ND	111.40	73.00	177.00	5.00	ND	20.00	3.20	0.30	
			August 1979	198.60	ND	ND	ND	115.20	42.70	170.30	6.80	ND	21.20	0.90	0.30	
			November 1979	198.50	ND	ND	0.50	164.60	109.60	213.30	6.20	ND	28.80	ND	0.10	
4	Spring III	I.G.P.S.M.S.	1961	191.00	2.00	ND	ND	115.00	67.00	171.00	11.00	ND	15.00	4.00	0.30	
			1974	184.00	ND	ND	ND	109.00	73.00	169.00	7.00	ND	22.00	ND	0.10	
			1976	184.00	0.50	ND	ND	144.00	48.00	132.00	7.00	ND	25.00	21.00	0.10	
			1977	202.00	1.00	ND	ND	86.00	61.00	171.00	7.00	ND	15.00	1.00	0.20	
			1977	191.00	ND	ND	ND	122.00	85.00	185.30	5.00	ND	32.00	ND	0.20	
	Spring No. 4	I.G.P.S.M.S.	June 1978	184.00	0.50	ND	ND	99.00	79.00	169.00	4.00	ND	21.00	ND	0.30	
			November 1978	191.00	ND	ND	ND	111.00	73.00	178.00	5.00	ND	20.00	ND	0.30	
			December 1978	187.00	ND	ND	ND	122.00	73.00	180.50	5.00	1.00	22.00	ND	0.10	
			August 1979	198.60	ND	ND	2.20	107.50	97.00	168.40	5.00	ND	40.10	5.30	0.30	
			November 1979	198.60	1.00	ND	ND	109.40	85.40	171.90	6.10	ND	25.60	2.90	0.20	
	Spring (pool under the bridge)	I.G.P.S.M.S.	1974	177.00	ND	ND	1.00	155.00	73.00	166.00	7.00	ND	24.00	ND	0.10	
			1976	212.00	ND	0.10	ND	105.00	207.00	213.00	6.00	ND	18.00	15.00	0.10	
			G. Ciortan	1937	266.00	ND	ND	ND	114.00	39.00	257.00	ND	ND	52.00	1.00	0.20
			1961	280.00	ND	0.20	ND	111.00	67.00	203.00	16.00	ND	27.00	8.00	0.10	
			1974	120.00	ND	ND	8.00	117.00	61.00	120.00	7.00	ND	27.00	ND	0.10	
Spring on granite rock		I.G.P.S.M.S.	1976	269.00	0.50	ND	2.00	110.00	73.00	210.00	7.00	ND	35.00	ND	0.10	
			1977	241.00	1.00	ND	ND	109.00	61.00	198.00	5.00	ND	25.00	ND	0.30	
			1977	226.00	ND	ND	ND	115.20	73.00	179.60	5.00	ND	29.60	6.00	0.30	
			June 1978	241.00	1.00	ND	ND	99.80	85.00	195.60	5.00	ND	27.20	2.00	0.30	
			November 1978	212.00	ND	ND	ND	113.00	61.00	166.00	5.70	1.00	38.50	ND	0.10	
Spring on granite rock	I.G.P.S.M.S.	December 1978	219.00	1.00	ND	ND	119.00	85.00	193.00	6.00	1.00	29.60	ND	0.10		
		August 1979	241.00	ND	ND	ND	111.00	54.00	180.00	8.00	ND	33.30	3.00	0.30		
		November 1979	241.00	ND	ND	ND	107.00	73.00	196.00	6.00	ND	28.80	ND	0.30		
		November 1978	212.00	1.50	ND	ND	105.60	79.30	184.00	5.40	ND	27.20	ND	ND		
		December 1978	205.00	ND	ND	0.20	107.50	85.00	181.00	5.40	1.00	27.20	ND	0.10		
November 1979	212.00	ND	ND	ND	103.70	73.20	179.00	5.30	ND	26.40	ND	0.30				

Table 1. Summary of Water Quality Data in Cerna Valley – Baile Herculane, Romania.

NO	LOCATION	COMPANY COLLECTED WATER SAMPLES	DATE	ANIONS						CATIONS					
				Cl <sub>2</sub>	Br	I	NO <sub>2</sub>	SO <sub>4</sub>	HCO <sub>3</sub>	Na	K	NH <sub>4</sub>	Ca	Mg	Fe
				mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
5	Scorilo (well 4575 I.F.L.G.S.)	I.G.P.S.M.S.	1970	1,020.00	0.50	ND	ND	182.00	109.00	292.00	9.00	ND	30.00	13.00	0.50
			1974	1,418.00	ND	ND	ND	115.00	61.00	251.00	8.00	ND	36.00	ND	0.10
			1976	297.00	1.00	0.10	ND	122.00	61.00	236.00	7.00	ND	24.00	ND	0.10
			1977	297.00	1.00	0.10	ND	113.00	61.00	237.00	7.00	ND	24.00	ND	0.10
			1977	312.00	15.00	0.10	ND	134.00	48.00	238.00	6.00	ND	37.00	ND	0.20
			June 1978	304.00	1.00	ND	ND	115.00	48.00	239.00	6.00	ND	34.00	1.90	3.00
			November 1978	283.00	ND	ND	ND	86.00	54.00	188.00	7.00	1.00	45.00	ND	0.10
			December 1978	319.00	ND	ND	ND	128.00	48.00	243.00	7.00	1.00	33.00	ND	0.10
			August 1979	304.00	ND	ND	ND	119.00	48.00	225.00	7.00	ND	35.00	1.00	0.30
			November 1979	319.00	ND	ND	ND	119.00	48.00	240.00	6.00	ND	32.00	ND	0.30
			1951	33.00	ND	ND	ND	13.00	119.00	13.00	1.00	ND	45.00	2.00	0.60
			1955	620.00	0.10	3.00	ND	92.00	138.00	344.00	21.00	ND	247.00	7.00	ND
			1961	418.00	ND	0.20	ND	42.00	184.00	170.00	22.00	ND	131.00	13.00	0.80
			1963	1,949.00	2.00	0.70	ND	128.00	73.00	752.00	64.00	ND	481.00	5.00	ND
1974	191.00	ND	0.10	ND	43.00	170.00	83.00	6.00	ND	89.00	10.00	0.10			
1978	1,099.00	1.00	ND	ND	67.00	122.00	482.00	1.00	ND	262.90	ND	0.20			
7	Hercules I Spring/Cave	I.G.P.S.M.S.	November 1978	1,773.00	1.00	ND	ND	103.00	97.00	726.00	31.00	ND	412.80	9.00	0.20
			December 1978	1,702.00	1.00	ND	ND	103.00	97.00	643.00	34.00	1.00	385.90	63.00	0.10
			August 1979	1,524.00	1.30	0.10	ND	111.00	109.00	595.00	30.00	ND	392.80	11.00	0.20
			1976	1,502.00	1.00	0.20	ND	122.00	97.00	645.00	24.00	ND	344.00	8.00	0.10
			1977	822.00	2.00	0.20	ND	57.00	115.00	344.00	10.00	ND	208.00	8.00	0.10
			1977	1,616.00	2.00	0.30	ND	109.00	24.00	509.00	24.00	ND	400.80	19.00	0.15
			August 1978	1,549.00	ND	0.10	ND	74.00	103.00	618.00	31.00	ND	365.00	10.00	0.20
			1951	675.00	4.00	ND	ND	57.00	12.90	306.00	1.00	ND	16.00	6.00	0.20
			1961	1,614.00	3.00	80.00	ND	154.00	97.00	713.00	34.00	ND	357.00	17.00	ND
			1974	744.00	1.00	2.00	ND	80.00	134.00	306.00	14.00	ND	210.00	8.00	0.03
			1977	1,007.00	1.70	5.00	ND	80.00	122.00	401.00	16.00	ND	286.50	ND	0.02
			1951	1,773.00	1.00	0.30	ND	126.00	63.00	725.00	43.00	0.30	412.00	3.00	0.60
			1961	2,202.00	40.00	0.30	ND	22.00	48.00	840.00	42.00	ND	504.00	7.00	ND
			1976	1,347.00	2.00	0.60	ND	107.00	122.00	576.00	19.00	ND	298.00	2.00	0.20
1977	1,418.00	4.00	3.00	ND	86.00	109.00	610.00	28.00	ND	297.00	14.00	0.20			
9	Apollo I Spring	I.G.P.S.M.S.	1977	1,425.40	2.00	0.40	ND	119.00	109.00	443.00	215.00	ND	312.60	42.00	0.15
			June 1978	1,382.00	1.00	ND	ND	153.00	103.00	503.00	282.00	ND	393.00	9.00	0.50
			December 1978	1,562.00	1.50	ND	0.20	195.80	85.30	616.00	29.00	ND	416.80	1.20	0.20
			August 1979	1,304.00	ND	ND	ND	-	103.00	492.00	27.00	1.00	316.60	20.00	0.10
			November 1979	1,687.00	ND	0.15	ND	168.00	122.00	668.00	33.00	ND	378.00	45.00	0.10
			1974	1,524.00	1.00	0.40	ND	107.00	85.00	645.00	23.00	ND	360.00	ND	0.10
			1976	1,175.00	4.00	0.50	ND	130.00	37.00	646.00	21.00	ND	298.00	22.00	0.20
			1977	1,524.00	2.00	0.30	ND	105.00	73.00	678.00	32.00	ND	299.00	13.00	0.10
			June 1978	1,468.00	4.00	ND	ND	124.00	48.00	632.00	23.00	ND	37.00	17.00	0.20
			November 1978	1,468.00	1.00	0.20	ND	111.30	54.00	637.00	28.00	1.00	323.00	ND	0.10
			December 1978	1,453.00	1.00	ND	ND	138.00	39.00	595.00	33.00	1.00	322.00	17.00	0.10
			August 1979	1,595.00	1.00	0.10	ND	99.00	36.60	509.00	31.00	1.00	400.00	ND	0.10
			November 1979	1,510.00	1.50	0.40	ND	107.00	3.70	652.00	31.00	2.50	312.60	7.00	0.50
			1951	779.00	0.03	0.40	ND	16.00	16.00	307.00	14.00	ND	214.00	10.00	0.50
1961	561.00	ND	0.07	ND	9.00	257.00	172.00	3.00	ND	158.00	17.00	ND			
11	Hebe Spring	I.G.P.S.M.S.	June 1978	1,276.00	0.15	ND	ND	82.00	122.00	518.00	12.00	ND	296.00	25.00	0.40
			November 1978	1,113.00	1.50	ND	ND	69.00	146.00	519.00	23.00	ND	246.00	4.80	0.30
			December 1978	1,205.60	1.00	ND	ND	84.50	15.60	485.00	21.00	ND	291.80	26.00	0.60
			August 1979	42.00	ND	ND	ND	36.00	390.00	0.10	3.10	1.00	84.00	34.00	0.10
			November 1979	1,198.00	1.00	0.30	ND	46.00	207.00	489.00	23.00	4.00	295.00	13.00	1.60
			1951	3,277.00	9.00	0.60	ND	16.00	122.00	1,297.00	56.00	0.20	744.00	2.00	0.20
			1961	3,287.00	5.00	0.20	ND	39.00	ND	1,519.00	57.00	ND	730.00	28.00	ND
			1977	3,475.00	2.00	0.50	ND	96.00	97.00	1,492.00	64.00	10.00	676.00	9.00	0.20
			1977	3,333.00	2.50	0.90	ND	84.00	48.00	1,358.00	61.00	1.00	702.00	7.00	0.20
			June 1978	3,510.00	3.00	ND	ND	117.00	ND	1,431.00	56.00	ND	757.00	ND	0.20
			November 1978	3,546.00	1.00	0.70	ND	159.00	ND	1,373.00	61.00	1.00	841.00	ND	0.10
			December 1978	3,404.00	2.00	ND	ND	138.00	ND	1,358.00	52.00	ND	734.00	22.00	0.30
			August 1979	3,546.00	1.00	0.50	ND	101.00	48.00	1,406.00	72.00	1.00	801.00	ND	1.40
			November 1979	3,368.00	1.00	0.50	ND	46.00	122.00	1,370.00	50.00	10.00	707.00	14.00	0.30
12	Diana I + II Springs	I.G.P.S.M.S.	1977	3,333.00	2.50	0.90	ND	84.00	48.00	1,358.00	61.00	1.00	702.00	7.00	0.20
			June 1978	3,510.00	3.00	ND	ND	117.00	ND	1,431.00	56.00	ND	757.00	ND	0.20
			November 1978	3,546.00	1.00	0.70	ND	159.00	ND	1,373.00	61.00	1.00	841.00	ND	0.10
			December 1978	3,404.00	2.00	ND	ND	138.00	ND	1,358.00	52.00	ND	734.00	22.00	0.30
			August 1979	3,546.00	1.00	0.50	ND	101.00	48.00	1,406.00	72.00	1.00	801.00	ND	1.40
			November 1979	3,368.00	1.00	0.50	ND	46.00	122.00	1,370.00	50.00	10.00	707.00	14.00	0.30

Table 1. Summary of Water Quality Data in Cerna Valley – Baile Herculane, Romania.

NO	LOCATION	COMPANY COLLECTED WATER SAMPLES	DATE	ANIONS							CATIONS						
				Cl <sub>2</sub>	Br	I	NO <sub>2</sub>	SO <sub>4</sub>	HCO <sub>3</sub>	Na	K	NH <sub>4</sub>	Ca	Mg	Fe		
				mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l		
13	Diana III Spring (I.B.F. Well)	I.G.P.S.M.S.	I.B.F.	1960	2,150.00	0.70	0.50	ND	7.00	122.00	900.00	37.00	ND	445.00	3.00	6.00	
				1961	2,187.00	0.50	0.10	ND	17.00	18.00	984.00	39.00	ND	439.00	13.00	ND	
				1974	2,127.00	1.00	0.50	ND	155.00	37.00	912.00	44.00	ND	464.00	ND	0.10	
				1976	2,092.00	2.00	1.00	ND	115.00	36.00	945.00	28.00	ND	355.00	29.00	2.00	
				1977	2,127.00	1.00	0.50	ND	ND	109.00	952.00	41.00	7.00	372.00	4.00	0.10	
				1977	2,099.00	1.00	1.00	ND	88.00	244.00	999.00	26.00	2.00	400.00	9.00	1.00	
				June 1978	2,056.00	3.00	ND	ND	155.00	ND	930.00	36.00	ND	399.00	ND	0.20	
				November 1978	2,960.00	1.00	0.30	ND	57.00	109.00	1,309.00	46.00	7.00	555.00	2.00	0.20	
				December 1978	2,092.00	1.00	ND	ND	130.00	ND	882.00	36.00	2.00	426.00	14.00	0.70	
				August 1979	2,092.00	1.00	0.20	ND	97.00	12.00	881.00	68.00	ND	428.00	ND	0.10	
14	Diana IV Spring	I.G.P.S.M.S.		1974	2,085.00	4.00	0.30	ND	28.00	ND	950.00	37.00	14.00	352.00	7.00	0.40	
				1974	3,056.00	3.00	5.00	ND	100.00	97.00	1,302.00	59.00	ND	637.00	ND	0.10	
				November 1978	2,198.00	1.00	ND	ND	92.00	48.00	778.00	39.00	1.00	557.00	24.00	0.10	
				1974	2,815.00	1.00	0.50	ND	115.00	134.00	1,172.00	48.00	ND	599.00	22.00	ND	
15	Diana V Spring	I.G.P.S.M.S.		1976	2,588.00	2.00	1.00	ND	46.00	134.00	1,070.00	28.00	4.00	488.00	52.00	0.20	
				December 1978	2,822.00	1.00	ND	ND	63.00	45.00	1,129.00	45.00	2.00	579.00	48.10	0.10	
				August 1979	2,340.00	2.00	0.10	0.70	96.00	73.00	512.00	39.00	4.00	901.00	7.00	0.70	
				November 1979	2,978.00	1.00	0.50	ND	65.00	122.00	1,226.00	52.00	10.00	644.00	ND	0.30	
16	Neptun I Spring	I.G.P.S.M.S.	I.B.F.	1951	3,753.00	3.00	0.40	0.30	32.00	128.00	1,470.00	1.00	ND	861.00	4.00	1.00	
				1961	3,772.00	3.00	2.00	ND	133.00	24.00	1,500.00	49.00	ND	833.00	13.00	0.40	
				November 1978	3,687.00	1.50	0.70	ND	163.00	ND	1,449.00	60.00	1.00	857.00	ND	0.50	
				August 1979	3,581.00	1.50	0.40	ND	192.00	ND	1,424.00	61.00	1.00	825.00	ND	0.10	
				November 1979	2,801.00	1.00	0.20	ND	115.00	73.00	1,013.00	48.00	ND	737.00	ND	0.10	
				1974	3,772.00	1.00	0.70	ND	63.00	73.00	1,439.00	66.00	ND	894.00	ND	ND	
17	Neptun I + IV Springs	I.G.P.S.M.S.		1976	3,687.00	2.00	1.80	ND	61.00	10.90	1,445.00	70.00	4.00	764.00	49.00	0.20	
				1977	3,723.00	40.00	0.70	ND	345.00	97.00	1,748.00	63.00	ND	763.00	ND	0.10	
				1977	3,687.00	2.00	1.00	ND	124.00	48.00	484.00	66.00	1.00	806.00	5.00	0.20	
				June 1978	3,581.00	1.50	ND	ND	167.00	ND	1,342.00	56.00	ND	895.00	ND	0.10	
				December 1978	3,634.00	2.40	1.00	ND	153.00	ND	1,416.00	67.00	1.00	800.00	20.00	0.30	
				I.B.F.	1951	3,780.00	2.00	0.60	ND	2.00	132.00	1,452.00	66.00	ND	880.00	5.00	ND
18	Neptun II Spring (stomach)	I.G.P.S.M.S.		1961	3,780.00	5.00	0.20	ND	1.60	36.00	1,593.00	59.00	ND	794.00	13.00	ND	
				1974	3,957.00	1.00	0.80	ND	114.00	109.00	1,561.00	64.00	ND	862.00	46.00	ND	
				1976	3,829.00	2.00	1.50	ND	42.00	122.00	1,497.00	73.00	4.00	745.00	78.00	0.20	
				June 1978	3,794.00	1.00	ND	ND	134.00	24.00	1,436.00	57.00	ND	927.00	ND	0.10	
				November 1978	3,129.00	2.00	0.20	ND	134.00	48.00	1,664.00	56.00	4.00	737.00	9.00	0.20	
				August 1979	3,847.00	1.00	0.30	ND	138.00	ND	1,579.00	62.00	ND	811.00	5.00	0.70	
19	Neptun III Spring (eyes)	I.G.P.S.M.S.		November 1979	3,808.00	3.50	0.50	ND	23.00	158.00	1,557.00	60.00	30.00	756.00	7.00	0.40	
				I.B.F.	1951	3,722.00	5.00	0.60	ND	95.00	75.00	1,419.00	66.00	ND	888.00	3.00	ND
				1961	3,627.00	2.00	0.20	ND	91.00	36.00	1,530.00	61.00	ND	770.00	8.00	ND	
				1974	3,673.00	2.00	0.70	ND	195.00	84.00	1,489.00	64.00	ND	817.00	ND	ND	
				1976	3,652.00	3.00	1.00	ND	188.00	ND	1,444.00	69.00	ND	729.00	72.00	0.20	
				1977	3,687.00	6.00	0.60	ND	107.00	97.00	1,499.00	67.00	6.00	80.10	7.00	0.10	
				1977	3,811.00	2.00	0.90	ND	182.00	73.00	1,475.00	67.00	1.00	854.00	10.00	0.10	
				June 1978	3,653.00	15.00	ND	ND	184.00	ND	1,370.00	57.00	ND	197.00	ND	0.10	
				November 1978	3,687.00	6.00	3.00	ND	168.00	ND	1,481.00	55.00	1.00	828.00	9.00	0.20	
				December 1978	3,811.00	2.50	ND	ND	119.00	24.00	1,454.00	103.00	1.00	848.00	26.00	0.30	
				August 1979	3,652.00	2.50	0.90	ND	163.00	ND	1,408.00	64.00	ND	857.00	9.00	1.00	
				November 1979	3,652.00	1.50	0.30	ND	151.00	61.00	1,305.00	60.00	ND	969.00	ND	0.10	
20	Venera I Spring	I.G.P.S.M.S.		I.B.F.	1951	4,113.00	20.00	0.80	ND	27.00	98.00	1,578.00	49.00	0.90	944.00	23.00	0.20
				1961	3,999.00	25.00	0.20	ND	49.00	100.00	1,465.00	69.00	ND	1,049.00	22.00	0.50	
				1976	4,184.00	1.00	1.00	ND	56.00	134.00	1,660.00	73.00	15.00	909.00	6.00	0.10	
				1977	4,077.00	4.00	0.80	ND	49.00	122.00	1,621.00	78.00	17.00	876.00	10.00	0.10	
				1977	4,077.00	2.50	3.00	ND	207.00	146.00	1,661.00	61.00	ND	920.00	24.00	0.15	
				June 1978	4,148.00	1.50	ND	ND	105.00	24.00	1,516.00	64.00	ND	1,006.00	22.00	0.20	
				November 1978	4,184.00	3.50	0.30	ND	230.00	ND	1,779.00	56.00	ND	873.00	5.00	0.30	
				December 1978	4,184.00	2.50	ND	ND	61.00	122.00	1,616.00	63.00	10.00	929.00	29.00	0.70	
				August 1979	3,705.00	2.50	0.60	ND	107.00	12.00	1,366.00	70.00	0.50	881.00	19.00	0.70	
	November 1979	4,148.00	1.00	0.50	ND	42.00	158.00	1,599.00	68.00	1.00	989.00	ND	0.10				

Table 1. Summary of Water Quality Data in Cerna Valley – Baile Herculane, Romania.

NO	LOCATION	COMPANY COLLECTED WATER SAMPLES	DATE	ANIONS								CATIONS			
				Cl <sub>2</sub> mg/l	Br mg/l	I mg/l	NO <sub>2</sub> mg/l	SO <sub>4</sub> mg/l	HCO <sub>3</sub> mg/l	Na mg/l	K mg/l	NH <sub>4</sub> mg/l	Ca mg/l	Mg mg/l	Fe mg/l
21	Venera II Spring (foot/legs)	I.G.P.S.M.S.	1961	3,879.00	3.00	0.20	ND	43.00	119.00	1,156.00	66.00	ND	896.00	32.00	0.50
			1974	3,950.00	1.00	0.70	ND	36.00	134.00	1,521.00	67.00	ND	599.00	22.00	ND
			1976	3,687.00	1.00	1.00	ND	92.00	122.00	1,485.00	69.00	4.00	641.00	113.00	0.20
			November 1978	3,829.00	1.00	ND	ND	88.00	79.00	1,430.00	61.00	3.00	945.00	ND	0.10
			December 1978	2,865.00	3.00	ND	ND	138.00	48.00	1,573.00	59.00	ND	857.00	ND	0.30
			August 1979	3,670.00	1.50	0.20	ND	111.00	18.00	1,428.00	68.00	3.50	814.00	16.00	0.30
			November 1979	3,758.00	1.50	0.60	ND	76.00	122.00	1,447.00	63.00	10.00	841.00	27.00	0.30
			1969	4,521.00	ND	1.00	ND	268.00	232.00	2,052.00	120.00	2.00	873.00	9.00	3.00
			1976	4,521.00	1.00	1.50	ND	67.00	109.00	1,808.00	80.00	980.00	5.00	0.10	-
			1977	4,503.00	1.00	1.00	ND	19.00	109.00	1,799.00	82.00	6.00	941.00	19.00	0.10
22	Traian (Well 4571 I.F.L.G.S.)	I.G.P.S.M.S.	1977	4,397.00	2.00	1.20	ND	92.00	78.00	1,762.00	78.00	ND	993.00	ND	1.00
			June 1978	4,545.00	1.50	ND	ND	115.00	48.00	1,925.00	57.00	ND	977.00	ND	0.10
			November 1978	4,397.00	5.00	0.90	ND	72.00	12.00	1,592.00	64.00	1.50	973.00	22.00	0.20
			December 1978	4,457.00	1.00	ND	ND	172.00	61.00	1,759.00	63.00	1.50	1,002.00	24.00	0.10
			August 1979	4,432.00	1.70	0.40	ND	103.00	12.00	1,759.00	57.00	ND	994.00	ND	0.10
			November 1979	4,432.00	1.00	0.50	ND	153.00	122.00	1,707.00	88.00	1.00	1,032.00	ND	0.10
			1970	4,509.00	5.00	0.40	ND	177.00	366.00	2,598.00	90.00	ND	370.00	72.00	0.10
			1974	4,751.00	6.00	0.70	ND	249.00	122.00	1,967.00	84.00	ND	1,074.00	ND	0.10
			1976	4,581.00	4.00	2.00	ND	307.00	73.00	1,782.00	84.00	ND	1,002.00	37.00	0.10
			1977	4,538.00	5.00	1.00	ND	57.00	122.00	1,790.00	87.00	20.00	955.00	24.00	0.10
23	Decebal (Well 4573 I.F.L.G.S.)	I.G.P.S.M.S.	1977	4,609.00	1.00	0.70	ND	109.00	122.00	1,843.00	88.00	ND	1,010.00	14.00	0.10
			June 1978	4,538.00	1.00	ND	ND	103.00	134.00	1,748.00	68.00	4.00	1,074.00	48.00	0.10
			November 1978	4,580.00	5.00	14.00	ND	151.00	ND	1,952.00	55.00	ND	975.00	45.00	0.20
			December 1978	4,609.00	2.00	0.70	ND	139.00	18.00	1,746.00	56.00	1.50	1,112.00	ND	0.10
			August 1979	4,457.00	1.30	0.40	ND	107.00	24.00	1,698.00	37.00	ND	997.00	51.00	0.20
			November 1979	4,503.00	1.00	0.20	ND	119.00	73.00	1,678.00	75.00	ND	1,120.00	ND	0.10
			1975	4,787.00	2.00	2.00	ND	61.00	73.00	1,883.00	75.00	ND	787.00	175.00	0.20
			1977	4,787.00	3.00	1.00	ND	ND	85.00	1,914.00	78.00	7.00	998.00	16.00	0.10
			1977	4,787.00	1.00	1.40	ND	80.00	85.00	1,927.00	79.00	ND	1,058.00	ND	0.10
			June 1978	5,106.00	1.00	1.00	ND	259.00	85.00	2,208.00	62.00	1.00	1,055.00	ND	0.10
24	Fabrica de Var (Well 4578 I.F.L.G.S.)	I.G.P.S.M.S.	November 1978	4,893.00	4.00	0.40	ND	142.00	ND	2,119.00	55.00	ND	1,033.00	7.80	1.30
			December 1978	4,680.00	2.50	1.00	ND	128.00	ND	809.00	6.00	1.50	1,088.00	ND	0.40
			August 1979	5,744.00	1.50	0.50	ND	126.00	ND	2,592.00	70.00	2.00	1,002.00	ND	0.10
			November 1979	4,964.00	1.50	0.30	ND	65.00	97.00	1,919.00	65.00	8.00	1,027.00	68.00	0.70
			1977	4,645.00	2.00	1.50	ND	75.00	55.00	1,851.00	75.00	7.50	1,009.00	15.00	0.10
25	Stadion (Well 4579 I.F.L.G.S.)	I.G.P.S.M.S.	June 1978	5,389.00	1.00	1.00	ND	105.00	73.00	2,395.00	68.00	ND	945.00	24.00	0.10
			November 1978	4,538.00	5.00	0.70	ND	113.00	ND	1,748.00	54.00	1.50	930.00	75.00	0.20
			December 1978	4,503.00	1.00	1.00	ND	74.00	97.00	1,806.00	63.00	1.00	1,001.00	ND	0.10
26	Piatra Puscata I Spring (Thermal Spring 3)	I.G.P.S.M.S.	November 1978	23.00	ND	ND	ND	19.00	109.00	19.00	7.70	ND	33.00	5.00	0.20
			December 1978	24.00	1.00	ND	ND	28.00	183.00	26.00	1.50	1.00	38.00	14.00	0.10
27	Piatra Puscata II Spring (Thermal Spring 1)	I.G.P.S.M.S.	1979	21.00	ND	ND	ND	35.00	122.00	15.00	1.40	ND	40.00	ND	0.10
			November 1978	28.00	ND	ND	ND	23.00	122.00	21.00	2.00	ND	37.00	5.40	0.20
28	7 Warm Springs (Right) - Spring No. 5*	I.G.P.S.M.S.	November 1978	191.00	ND	ND	ND	97.00	109.00	172.00	5.00	ND	23.00	5.40	0.30
			December 1978	191.00	ND	ND	ND	119.00	85.00	177.00	5.10	0.50	28.00	ND	0.10
29	Jack Springs - Downstream	I.G.P.S.M.S.	December 1978	159.00	ND	ND	ND	117.00	85.00	151.00	5.50	0.50	31.00	ND	0.10
30	Spring*	I.G.P.S.M.S.	December 1978	194.00	ND	ND	ND	122.00	109.00	117.00	5.10	0.50	37.00	ND	0.10
31	Spring	I.G.P.S.M.S.	November 1978	7.10	ND	ND	0.10	96.00	36.00	5.50	0.40	ND	14.00	ND	0.30

I.G.P.S.M.S. Intreprinderea Geologica de Prospectiuni pentru Substante Minerale Solide

I.B.F. Institutul de Balneologie si Fizioterapie

\* Not shown on the map