3.13.9. BUJORUL EBB AND FLOW SPRING (THE GILĂU MOUNTAINS)

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In the South-Eastern area of Muntele Mare, in the territory covered by the deposits of the Biharia Nappe, there are a few bands of widely recrystallized limestones, well shaped in relief through a massive posture, with steep slopes and white majestic peaks (P. COCEAN, B. ONAC, 1989). Among those, the Pleşa Cocorei-Vulturel-Bujor band, develop between Ocolişu and Sălciuţa valleys, is the largest. It has a long ridge of 12,5 km, cut in its median section by Poşaga river and lithologically made of crystalline limestones and graphite dolomites together with quartzite part of Păiuşeni series (Fig. 9.1). This deposits is placed as an fold antecline dip to the North-West, built in Poşaga valley by graphite dolomites (30 m) and marbles (500 m) in the reversed side and of the same marbles, graphite dolomite and quartzite beds in the normal side (I. MÂRZA, 1969, I. BALINTONI et al., 1987). The marbles are highly cracked and cut and get off in plates.

Given this geological and structural context, Bujorul ebb and flow spring comes at the exit of Poşaga river out of the canyon it cuts in the section of crystalline limestones, on the right side, and opposite it, on the left side, Feredeu spring (B and F, photo 1 and 2). 200 m down the springs, Poşaga Monastery is found.

The only references about Bujorul spring were found in a paper by I. AL. MAXIM (1941). The author describes the morphological and geological context of the spring, mentions a personal observation taken in August when the eruptions of water come at every 45 minutes, and suggests the generation of the spring through a simply siphon mechanism.

In 1988, Bujorul spring was forgotten and often flooded by Poşaga river, and when the waters are really high, Feredeu spring is also covered. The spring comes ascedingly on a karst oval vertical pipe, with a medium diameter of about 60 cm and an opening to the river. It is shaped by the dissolution of crystalline limestones, its lower section being filled with sand and gravel (photo 3).

Beginning of eruption is indicated by the move of sands on the bottom of the spring, near the limestone wall. On 23 July 1988 we recorded oscillations of the level of Bujorul spring as presented in Fig. 9.2.

During summer 1990, together with a few colleagues we deepened the valley of the river along the springs, improvising a dam out of stone blocks to protect the Bujorul spring. On 19 July 1990, we introduced and placed a weir concrete iron plate 90 cm long, with a low cut in the upper section to

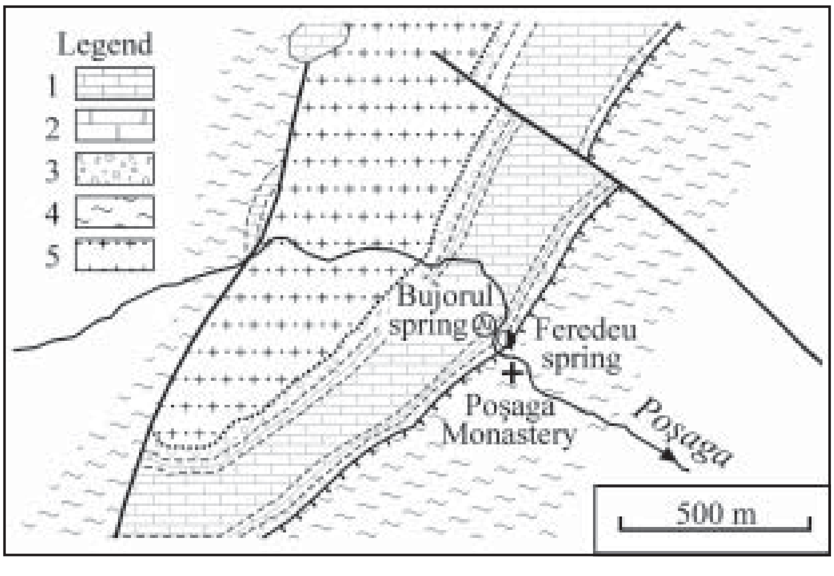

Figure 9.1. Geological map of Bujorul spring area (after I. BALINTONI a.o., 1987).
Legend:
1 - crystalline limestones;
2 - graphite dolomites;
3 - metamorphosed conglomerates;
4 - crystalline shists;
5 - granites.

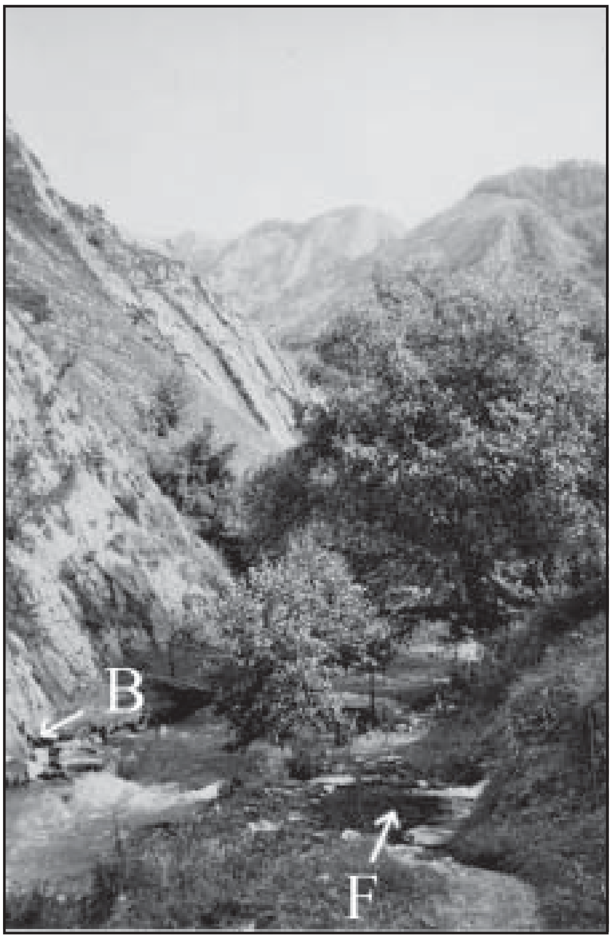

Photo 1

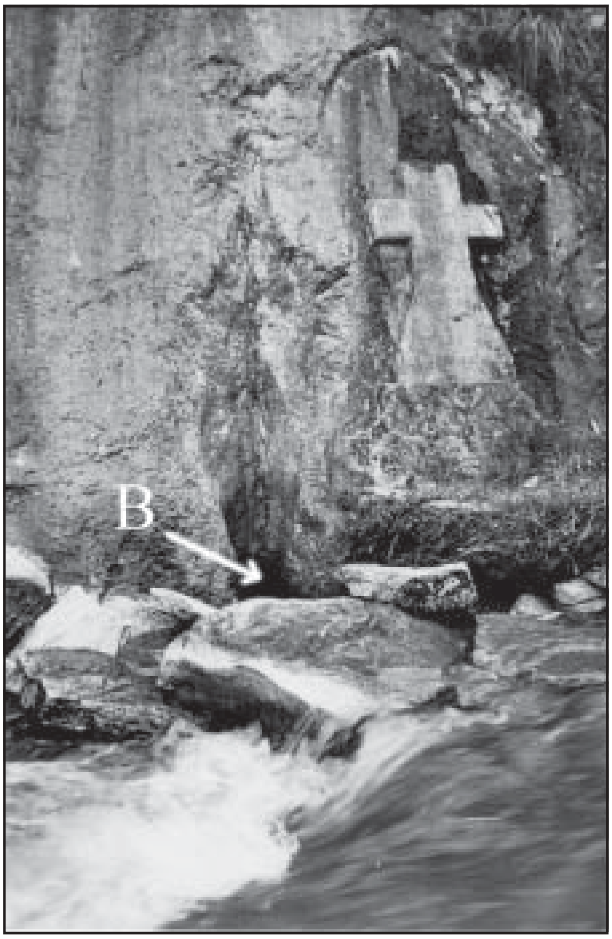

Photo 2

Photo 3

Photo 4

Photo 5

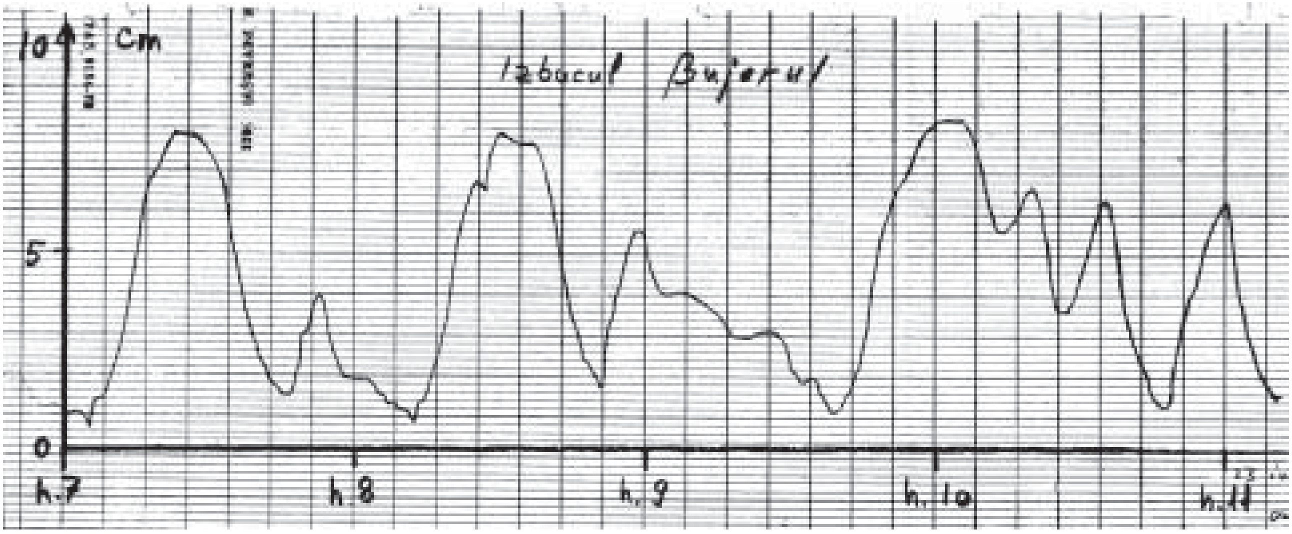

Figure 9.2. Oscillations of water level in pool of Bujorul ebb and flow spring in 23 July 1988.

measure the debit and note the oscillations (photo 4). The catchment works create a pool with approximate 50 cm water depth. In 2008, the part of Poşaga valley close to the springs was protected with concrete against future floods (photo 5).

During 1991-1992, the oscillations of water level into the pool were recorded for 5 time slots, for a total of 75 days, with a water level recorder 1:1, with 28 cm/day. During 24-29 May 2009, observations were based on data provided by a diver type sensor.

The water table has most ample oscillations of 6-8 cm for duration of 10-13 minutes, the relation between the rising and the decreasing being 1:4 (Fig. 9.3, B). Oscillations are in solitary clusters made of one, two, three or four oscillations at 20-30 minutes (Fig. 9.3, A and Fig. 9.4). The average break between the clusters varies between 7 and 14 hours, the maximum observed values reaching 31 hours. The evolution of cluster's oscillations periodicity was constant in the period of obserations (Fig. 9.5). The base flow of the spring was 0.035 l/s.

The maximum overflow discharge during one oscillation was of 1.6 l/s. The overflow of water out of the pool is temporary; for dry seasons, the level of water there goes down under the base level of weir, and the oscillations of water no generate overflow. The pool was not observed being empty. The temperatuere of the spring varies in between 9.5-13.3°C.

During 7-11 May 1991, the spring had series of oscillations followed by fast oscillations during

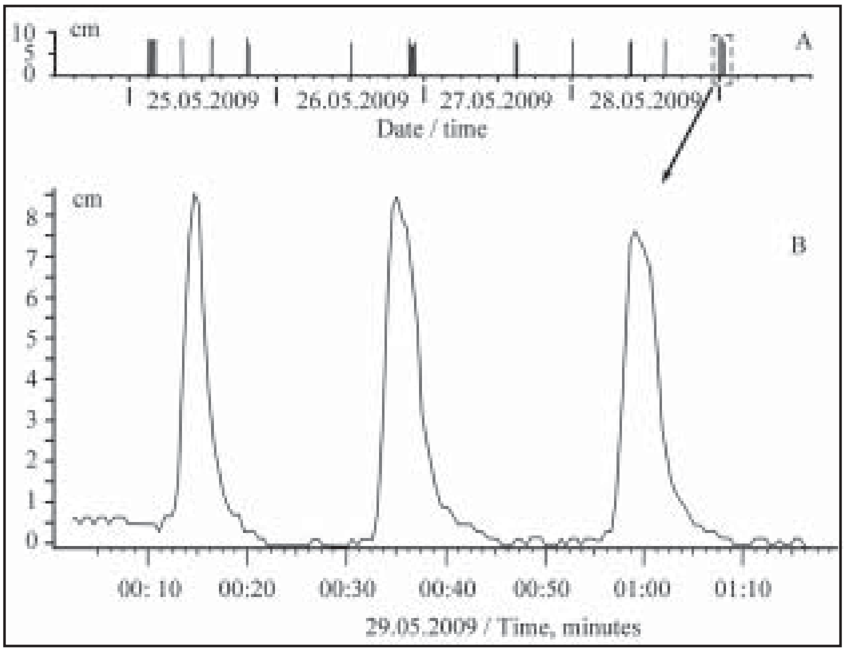

Figure 9.3. The water level oscillations in the Bujorul spring's pool registered with a diver type sensor in 25 - 28 May 2009 time period (A). In fig. B, detail of a cluster.

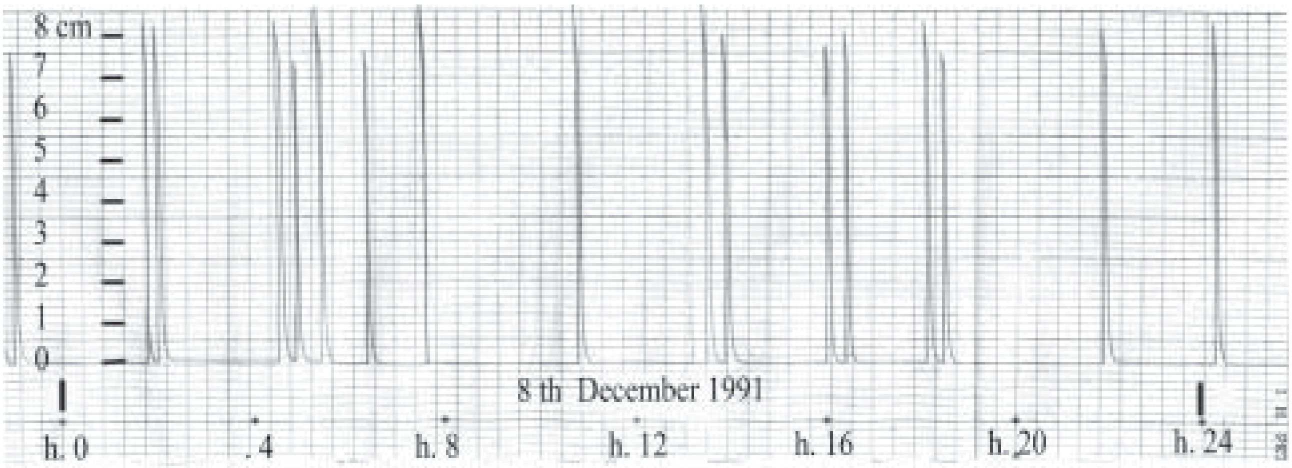

Figure 9.4. Current shapes of water level oscilations.

12-15 May (Fig. 9.6), and until 25 May fast oscillations interrupted by breaks and then other fast oscillations until 1 June (end of diagram). Fast oscillations has a periodicity of 10-13 minutes.

Brief observations undertaken indicate that Bujorul spring has a complex functioning. Insufficient data so far cannot explain the way it works.

Feredeu spring emerges from crystalline limestones close to quartzites. The temperature varies between 16.8-17.6°C and a debit of 8-120 l/s, with an average of 35 l/s. Gases similar to the atmosphere escape out of it. The water are Ca Mg – HCO_3 type, having a 711.6 mg/l TDS.

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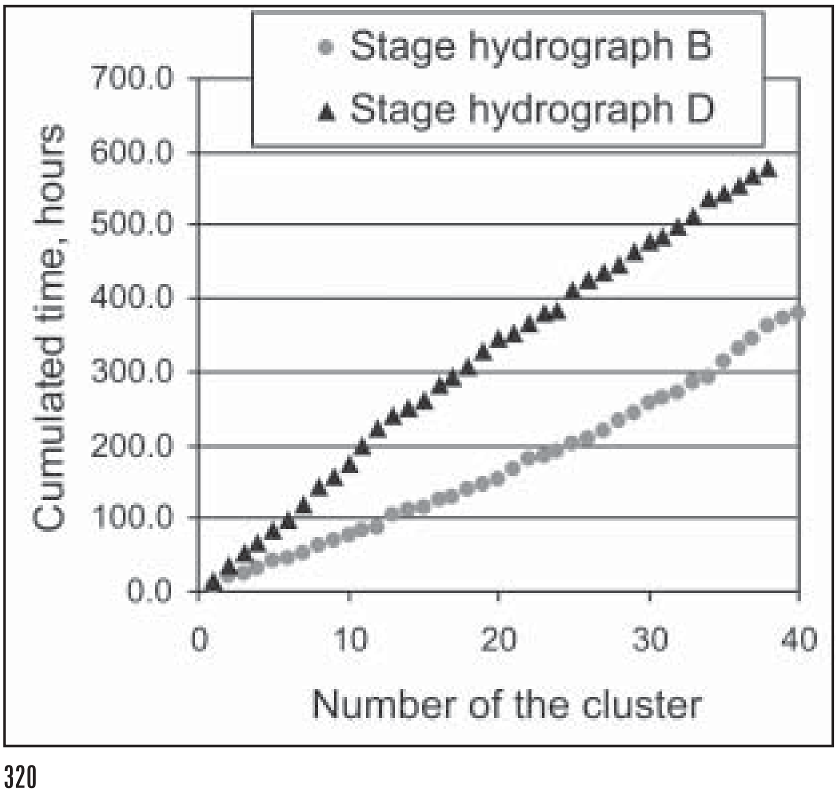

Figure 9.5. The evolution of cluster's oscillations periodicity.

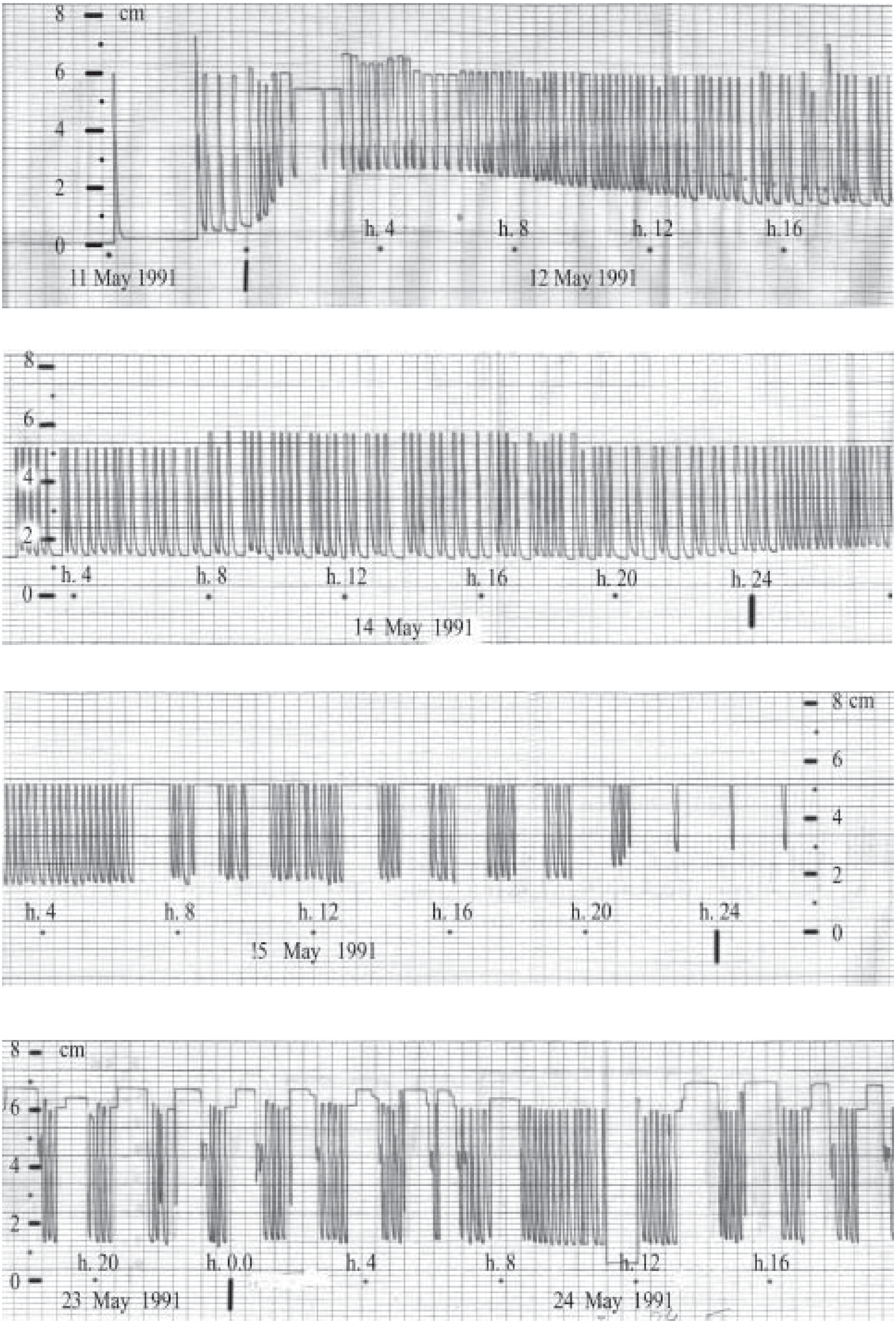

Figure 9.6. Various shapes of water level oscilation in Bujoru ebb and flow spring pool.