Cadernos Lab. Xeolóxico de Laxe
Coruña. 2001. Vol. 26, pp. 497-502

ISSN: 0213-4497

Preliminary report on sediments from Pocala Cave: sedimentological and heavy mineral analysis

Estudio sedimentológico preliminar y análisis de minerales pesados en la cueva Pocala

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ABSTRACT

In 1999 two borings were performedin the area of Pocala Cave, one outside the cave and the other inside in the cave. In particular four samples of the first boring were studied. It seems that mineralogy is strictly connected with sedimentology where quartz and plagioclase are present. It could be a consequence of a periodical floods of flysch sediments during interglacial period.

Key words: Pocala Cave, borings, mineralogy, stratigraphy

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INTRODUCTION

The Pocala Cave, (Aurisina, Trieste Karst, Italy) is an important Cave of Trieste Karst, discovered at the end of 1800. Pocala Cave is important for paleontology because between 1894 to 1929 about 300 *Ursus spaelaeus* were found in it. During those years a lot of people excavated in Pocala, among them we remember here Marchesetti (1905 - 1908), Moser (1894), Perko (1904), Neumann (1907 - 1914), Battaglia (1926 - 1929). Battaglia was the first one presenting the complete stratigraphy of the cave (Battaglia 1958-59). In 1928 Borghi performed the first chemical analyses on sediments from the bottom of the cave.

During the 90es mineralogical and sedimentological analyses were performed by the University of Trieste.

In the 1998 the "Museo Civico di Storia Naturale" of Trieste, resumed excavation, stratigraphy and mineralogical studies (CALLIGARIS, 1999; CALLIGARIS, 2000).

In the 1999, two borings were performed in the area of the Pocala Cave, one outside and the other inside the cave.

This work is part of the degree thesis of the first Author (A. Tremul).

METHODOLOGY

The borings were performed by means of a mechanical drill. The first one, actually located outside the cave, was about 12 meters deep. The second one, located inside the cave, was about 17 meters deep. At now, the analyses were performed only on the boring outside the cave.

Sedimentological analysis regarded in particular the first 10 meters of the boring where sand and clay are present. Cobbles and limestone levels constitute the remaining sediments. 54 samples of about 70gr of weight were baked, disaggregated and sieved by a mechanical sieve.

On the same samples L.O.I. (loss on ignition) were measured.

Sandy fraction of four selected samples was analysed by means of X-ray diffractometry (XRD).

Heavy mineral analyses were performed on the same four selected samples:

- 3A located at a depth of 2.2 meters and constituted by superficial sediments;
- 6B located at a depth of 5.4 meters and constituted by red/yellow lamination;
- 8A located at a depth of 7.2 meters and constituted by yellow sediments;
- 10C located at a depth of 9.6 meters and constituted by yellow sediments.

According to MORTON (1985), heavy minerals were looked for in the 63-250 mm where heavy minerals better concentrate. A magnetic concentrate was separated using a Frantz electromagnetic separator.

DISCUSSION

From the top of the boring to a depth of about 3 meters the colour of the sediments ranges from dark brown to brown (5YR3/3 – 5YR4/4; Munsell Soil Colours Charts). These sediments are considered as superficial sediments. Then, colour turned in reddish brown and at a depth of about 5-6 meters it is pink or pink – grey

(5YR6/2 – 7.5YR8/2; Munsell Soil Colours Charts) due to calcite levels. At about 7 meters it turned to ochre and reddish (10YR6/6 – 5YR4/6; Munsell Soil Colours Charts). In this level and for about 50 cm are present a succession of thin layers (millimetric to centimetric) of red and yellow sands (7.5YR4/4 – 10YR5/6; Munsell Soil Colours Charts). Ashes are present in all the boring but they are most abundant in this level. Yellow sands (10YR5/6; Munsell Soil Colours Charts) constitute the bottom of the boring.

As regards the sedimentological analyses the results are similar from the top to the bottom of the boring (apart of the calcite level). The sediments are bimodal, the first being in the coarse sand (0.6 mm) and the second in the array of silt/clay (0.063 mm) (figure 1); these results confirm the analysis performed on some levels inside cave (CUCCHI *et al*., 1992).

As regards the L.O.I. the mean values range between 10 and 15 wt.%. It is possible to recognise where calcite is abundant because the L.O.I. value increase (up to about 40 wt. % in the calcite level) (figure 2).

As regards the mineralogy of the main components, as individuated by XRD, in the 63-250 μm fraction in the sample 3A quartz and plagioclase are the main components while quartz and calcite (less than 10%) are present in the fraction 0.6-1.18 mm. In the 6B quartz and calcite are present in both of the analysed fraction. In the 8A quartz and plagioclase are present in the 63-250 mm fraction while quartz and calcite (less than 10%) are present in the fraction between 0.6-1.18 mm. In the 10C quartz, muscovite and calcite are present while quartz and calcite are present in both of the analysed fraction.

As regards the heavy minerals, the

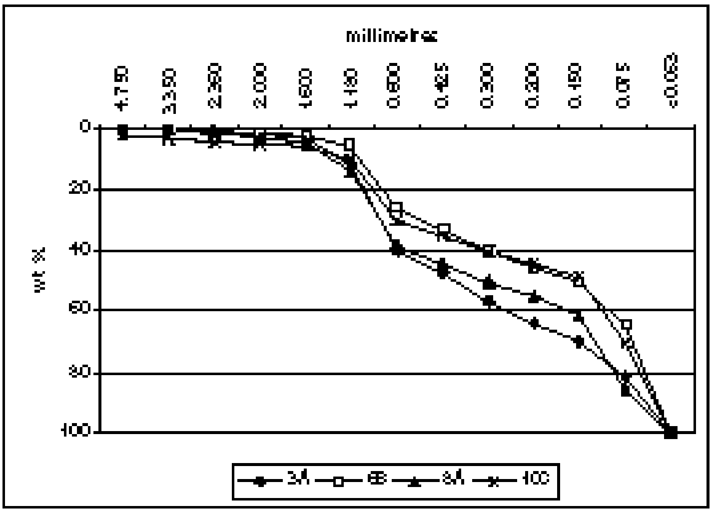

Figure 1. Cumulative curve of four selected samples.

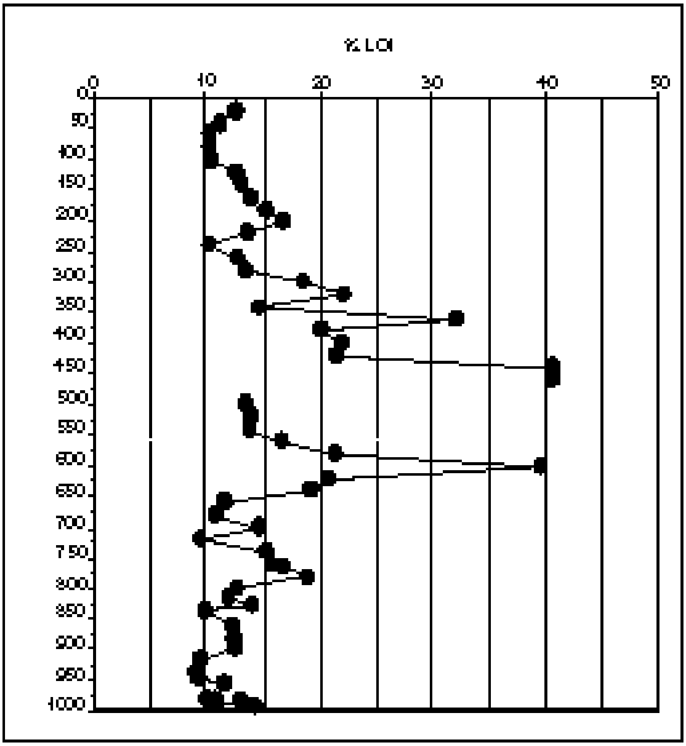

Figure 2. L.O.I. value in the boring outside the Pocala Cave

following minerals were recognised: rutile, muscovite, Fe-oxides and hydroxides, Cr-spinel, tourmaline, chlorite, amphibole and staurolite. Rutile, muscovite, Fe-oxides and hydroxides, Cr-spinel, tourmaline, chlorite are present in all the samples. It is to notice that amphibole and staurolite were recognised only in the superficial sediment (3A) where Cr-spinel and tourmaline are scarce. A great amount of muscovite and chlorite is present in the yellow sands present at the bottom of the boring (10C).

CONCLUSIONS

It seems that the mineralogy is strictly connected with the sedimentology, in fact where quartz and plagioclase are present in the silt-size material (samples 3A and 8A) this fraction is more abundant than in the samples where quartz and calcite are present (6B and 10C).

We suggest that the quartz-plagioclase silt-size deposition could be a consequence of periodical floods during interglacial period. During these periods flysch sediments were drained and heavy minerals there present accumulated in the cave sediments too. It is to notice that the same origin was proposed for the sediments of the dolina of the Trieste Karst (LENAZ *et al*., 1996; LENAZ, 1999).

The quartz-calcite deposition seems to be related to a source where the carbonate content is greater.

Apart from amphibole and staurolite, all the heavy minerals here recognised are present in the flysch surrounding the Karst area. We suggest that the presence of amphibole and staurolite in the superficial sediments could be related to a, probably eolian, supply.

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