Trip report of 13th of december 2011
in Eremita Cave
(Castillammare del Golfo, Sicily, Italy)

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Eremita and Cocci Caves are two caves located above the landscape on the slope of Inici Mont. Marco Vattano identified these caves as hypogenic origin during a rescueing mission. We took the opportunity to visit these caves with him during a special trip in Sicily. Eremita Cave dominates the natural hot pool and the old thermals buildings are located at the foot of hill. Formely, the hot sulfidic springs used to as thermal baths.

The west dip is clearly visible with layers of limestones, its colour is lighty red (**fig. 1**).

The cave is developped on the dip, the entrance leads to inclined gallery inhabited by porcupine.

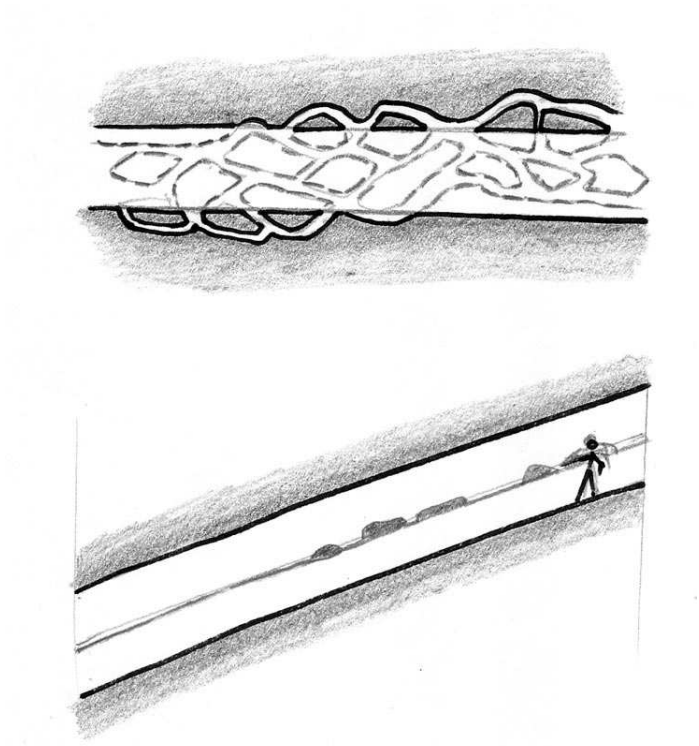
Fig. 1 : Ridge of Eremita Cave. The cave is located in the corner of the picture at the foot of ridge.

The circular sections of galleries show perfect shapes. The « scallops » could be seen on the wall and they look like these excavated in ice galleries. Obviously, theses galleries have been « recalibred » by the air flow or condensation-corrosion process.

The origin of gallery

The problem is identified the initial stage, before the condensation-corrosion process. This inclined gallery is clearly excavated from bedding plane. On the walls of this gallery, we can see speleogenesis just above the bedding plane ; it's a kind of hypogenic paragenesis. These conduits, probably anastomosing, are already visible on the wall. They are enterly infilled by pinked laminated fills. This type of sedimentation indicates a slowly stream without external provision.

These filling have a phreatic-hypogneic origin (**fig. 2**). The direction of stream went from bottom to the top. The fillings are probably insoluble autochthonous sediments.



The observation of this type of conduits is realy rare. In fact, it's often destroyed by the later widening of gallery by condensation-corrosion process (aero-hypogenesis).

Fig. 2 : Plan and section of anastomosing excavated from bedding plane in the initial stage (hypogenic paragenesis), after they are enlarged (« calibred ») in the later stage by condensation-corrosion process.

Fig. 3 : Gallery excavated from bedding plane. We can see initial anastomosing conduits developped above the bedding plane.

Fig. 4 : Gallery excavated from bedding plane. We notice a circular section entrenched as a little canyon (centre). On the left wall, the shape is clearly visible, but on right hand, the bedding plane doesn't allowed to see the shape.

Temperature

The temperature of Eremita Cave (18°C), higher than Abisso dei Cocci Cave located in the neighbourhood, can be explained by its relative proximity. Today, the Eremita Cave is located probably above the hot stream of sulfidc spring (**fig. 5**). The hot stream has shifted to the west side, following the dip (**fig. 6**).

There are more speleothems in Cocci Cave, colder than Eremita Cave. It shows that Eremita is younger than Cocci.

Fig. 5 : Hot sulfidic spring at foot of Monte Inici.

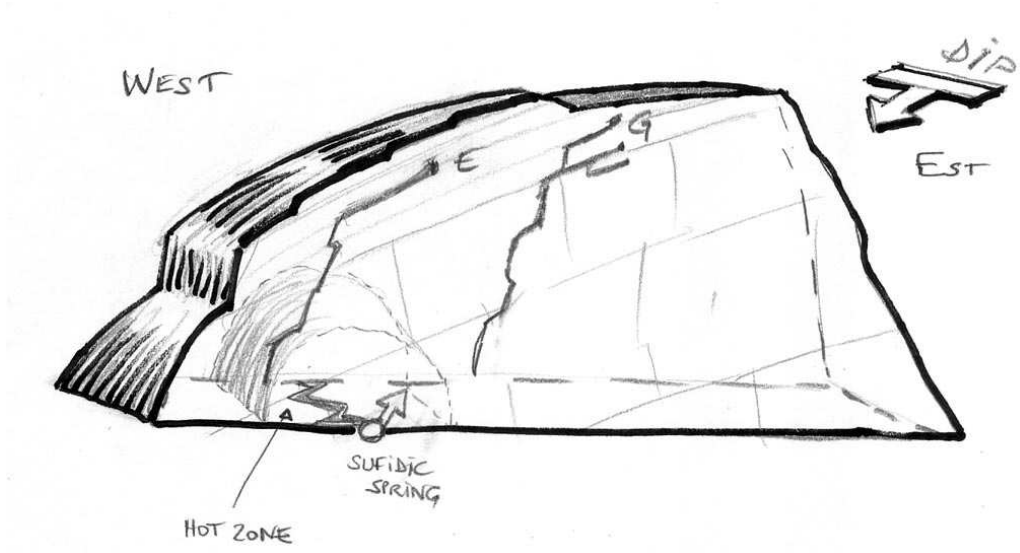


Fig. 6 : Block-diagram of Monte Inici. E = Eremita Cave, G = Abisso dei Cocci Cave.
The hot sulfidic spring shifted to the west on the dip with the lowering of base level. The bottom of Eremita Cave is hotter because close to the hot zone of sulfidic spring.

Speleothems

The Eremita Cave is almost without speleothems, only the rims of gypsum in low parts of gallery are visible (**fig. 7**). The speleothems are concentrated in the lower parts of the section of gallery (**fig. 8**) where the temperature is colder than the roof. In Abisso dei Cocci Cave, there are many stalagmites and stalactites ; it's the same conclusion : the Ermita Cave is younger than Abisso dei Cocci Cave.

Fig. 7 : Gypsum crusts.

Fig. 8 : Rims inclined in the low parts of gallery.

However, number of speleothems of Eremita Cave are synchronous with the channel in the centre excavated by condensation-corrosion process.

We can see the gypsum crusts covering the walls. On the bottom, the accumulated gypsum in the channel (**fig. 7**). In the gallery near the entrance, we can see rims (**fig. 8**) ; they indicate an imperceptible air flow running through the cave. The limit between the nacked rock and the crustal rock occurs as a wave. The undulations seem linked with the shape of the wall carved in great « scallops ».

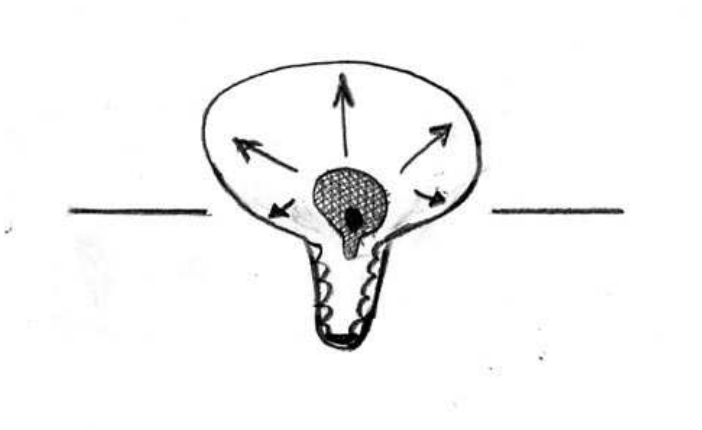


Fig. 9 : Section of gallery.

Section of conduit

The section of conduits is enigmatic because we could believe an entrechment by water flow running in a channel (**fig. 9**). But, we know that this idea is wrong. Beacuse we have noticed this channel in Abisso dei Cocci Cave. Indeed, the longitudinal profil is saw-toothed (broken line)...

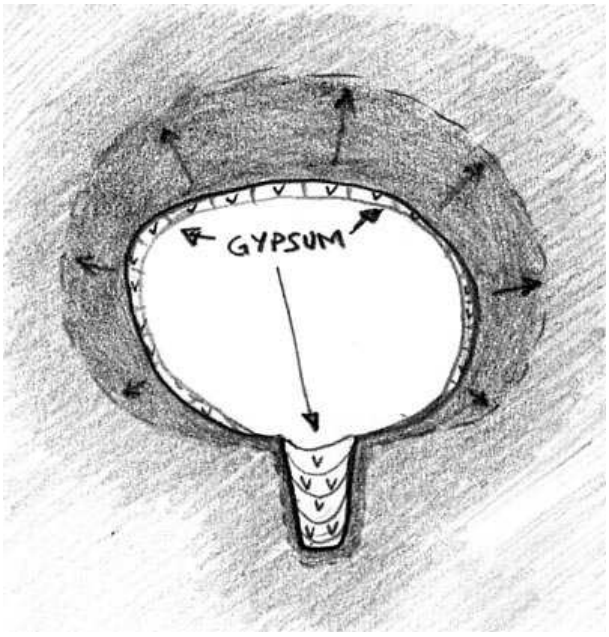


Fig. 10 : Probable evolution of gallery. The gypsum crusts pile up in the centre of gallery. The low part (crypto-corrosion) evolves slower than the up part (condensation-corrosion).

We have to find an other way of thinking. The own explanation is the condensation-corrosion process for the high part of gallery, but the low part is more difficult to precise. It's that is a convergent shape called « keyhole ». That is an overdevelopment of upper part (circular section) if we compare to the lower part.
This low part are infilled by gypsum fallen from the roof. This low part could evolved more slowly with crypto-corrosion (as lapiaz in the surface) by a simple contact between gypsum and limestones (**fig. 10**).

We don't forget that the gypsum is lighter than other fillings. It could be disappeared along the evolution of the gallery. And of course, the process start again with new crusts of gypsum.

Breccia and karst

In the breccia, we can find red laminated fillings. This breccia is located in the vertical parts while the bedding plane is located in the inclined gallery. It means that the breccia and bedding planes are discontinuities exploited by the initial water flow.

The wall shows the first speleogenesis in the breccia (**fig. 11**). We can see laminated sediments and also white crystals covering proto-conduits on the top of fillings. All the stages are concomitant and testify to an hypogenic water flow running through the protoconduits.

Fig. 11 : Karstified breccia filled of laminated sediments. On the top of filling, we can see a frame of calcite testified to alternation of corrosive and calciting runoff.

Conclusion

The recent uplift (Pliocene) in Sicily is the origin of variations of base levels (**fig. 12**), the outcrops and caves have been carry in altitude. In the Inici Mont, the hypogenic protoconduits have been dewatered and have allowed the ventilation of little conduits. The condensation-corrosion process enlarged (calibred) these initial conduits. The heat due to the thermal spring favooring the formation of corrosive aerosols (same chemical composition than sulfidic water of spring). The walls have been carved by large and special « scallops » or more : « aero-scallops » (**fig. 3 & 4**).

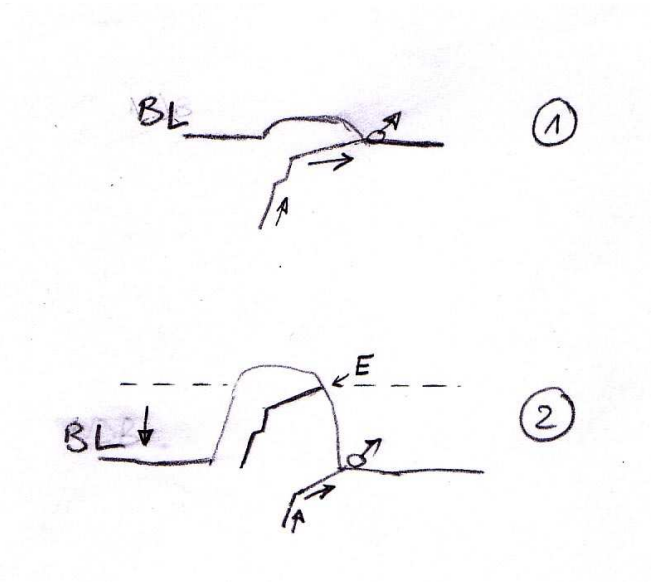


Fig. 12 : Stages of development of caves of Inici Mont. 1 – High base level. 2 – Lowering of base level.