



## **Peculiar wall channels connected to fault breccia in the Grotta di Entella gypsum cave (Western Sicily, Italy)**

José Maria Calaforra (1), Jo De Waele (2), Francesco Paolo Di Trapani (3), Giuliana Madonia (3), and Marco Vattano (3)

(1) Water Resources and Environmental Geology Research Group, University of Almeria, Cañada de San Urbano, s/n. -04120 Almeria, SPAIN (jmcalforra@ual.es), (2) Italian Institute of Speleology, University of Bologna, Via Zamboni 67 - 40127 Bologna, ITALY (jo.dewaele@unibo.it), (3) Geology and Geodesy Department, University of Palermo, Via Archirafi 20/22 – 90123 Palermo, ITALY (vattano@unipa.it)

Peculiar channels cut in gypsum cave walls have been observed in the Grotta di Entella, a gypsum cave about 900 m long and with a positive vertical range of +30 m, located in the Messinian evaporite outcrops in Western Sicily. The Grotta di Entella is developed mainly along the strikes of two fault systems (N60W and N130E) which influence the cave pattern and the shape of several passages. Between the displaced walls of the N60W system an about 70 cm thick fault gouge occurs. This fault gouge is made up of chaotically arranged clasts with different composition and size, separated by fine-grained light matrix. The clasts consist of centimetrical and decimetrical broken gypsum crystals and sharp-edged marly limestone cobbles. In addition to the fault gouge, great clear and translucent gypsum crystals and thin layers of fibrous gypsum (sericolite variety) can be found along the fault plains. In particular, the direction of the gypsum fibres and the analysis of the gypsum-steps in the fault walls suggest that either the N60W and N130E faults are reverse-oblique faults. The fault gouge played an important role in the evolution of the cave; the origin of several passages seems to be linked, at least in the first phases, to erosion of the fault breccia.

Along the fault walls peculiar channels here named “wall half-tubes” have been observed. These channels are sinuous or meandering, are elongated along the fault dip direction and usually arranged in groups. The “wall half-tubes” are very different in size, ranging between 50 and 350 cm in length (average 163.9 cm), from 3 to 25 cm in width (average 10.6 cm) and between 3 and 35 cm in depth (average 10.7 cm). In most cases the channels are cut both in the footwall and in the hanging wall of the faults, showing a dip angle comprised between 40° and 60°. “Wall half-tubes” are always accompanied by fault gouge.

The “wall half-tubes” are very similar to paragenetic half-tubes or to drainage grooves, but their genesis seems to be different. While the origin of the latter two forms is linked to dissolution of water during sediment-filling phases, in the genesis of “wall half-tubes” a key role seems to be played by the fault gouge. The “wall half-tubes” seem to have formed, in fact, during the early stages of evolution of the cave when the fault gouge had not yet been completely removed. Water flowing between the fault gouge and the gypsum walls dissolved the latter cutting the channels.