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Hypogene gypsum karst and sinkhole formation at Moncalvo (Asti, Italy)

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In the morning of February 15^{th} 2005, during excavation works in an underground gypsum quarry at Moncalvo (Asti, Northern Italy), a water-bearing fracture was intercepted at level 134 m a.s.l. During the night a large amount of water (approximately 60,000 m^3) and mud invaded the quarry tunnels reaching a height of 139 m a.s.l. at the morning of the day after. Meanwhile a large sinkhole (20 m wide and 10 m deep) formed on the surface. Hydrogeological surveys were immediately carried out to follow the quickly evolving situation.

Seven months after the disaster a survey of the inrush area was made possible enabling the exploration of a large natural cavity developed on three gypsum strata and interbedded marls. The sinkhole formed by the collapse of one of the main chambers of this cave when buoyant support provided by the water started to decrease due to lowering of the water table.

The shape of the voids show clear evidence of a phreatic origin with sculpted morphologies due to water under pressure. The recharge of this karst system is from below and only very minor quantities of infiltration water come from the above lying surface, as has also been confirmed by hydrochemical analysis. This is the first example of hypogean gypsum cave related to rising waters.

This hypogean karst is completely invisible at the surface and develops entirely underground showing no relation whatsoever with the surface. Its presence is therefore extremely difficult to reveal and such types of karst can thus make up extremely dangerous situations.