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Special Publication 18

Hypogene Cave Morphologies

Edited by
Alexander Klimchouk
Ira D. Sasowsky
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Scott A. Engel
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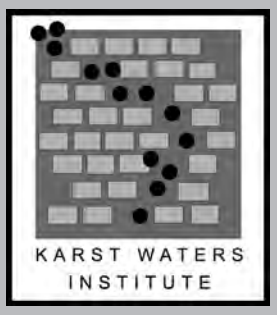

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2014

Selected papers and abstracts of the symposium held February 2 through 7, 2014, San Salvador Island, Bahamas

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Cover caption: Precision radial cave passage survey in progress at Altar Cave, San Salvador, Bahamas.
Photo credit: Ira D. Sasowsky

HYPOGENE CAVE MORPHOLOGIES

San Salvador, Bahamas
February 2-7, 2014

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A REVIEW ON HYPOGENE CAVES IN ITALY

Jo De Waele[1], Sandro Galdenzi[2], Giuliana Madonia[3], Marco Menichetti[4], Mario Parise[5], Leonardo Piccini[6], Laura Sanna[7], Francesco Sauro[1], Paola Tognini[8], Marco Vattano[3], and Bartolomeo Vigna[9]

Although hypogene cave systems have been described since the beginning of the 20th century, the importance in speleogenesis of ascending fluids that acquired their aggressiveness from in-depth sources has been fully realized only in the last decades. Aggressiveness of waters can be related to carbonic and sulfuric acids and the related corrosion-dissolution processes give rise to different types of caves and underground morphologies.

The abundance of hydrothermal springs and associated travertine deposits, and the widespread interaction between volcanic or sub-volcanic phenomena and karst in many sectors of the Italian peninsula are a strong evidence of hypogene speleogenesis. Furthermore, researches on secondary minerals have allowed to discover hypogene caves formed by highly acidic vapors in subaerial environments, also showing that most of these caves have extremely rich mineral associations.

Despite this, until the late 1980s the only known important cave systems of clear hypogene origin in Italy were considered to be the ones hosted in the Frasassi Canyon and Monte Cucco, in which important gypsum deposits undoubtedly showed that sulfuric acid played an important role in the creation of voids (Galdenzi, 1990, 2001; Galdenzi & Maruoka, 2003; Menichetti et al., 2007). Afterwards many other caves were categorized as formed by the sulfuric acid speleogenesis throughout the entire Apennines. Following the broad definition of hypogene caves by Palmer in 1991, and the even more general one of Klimchouk in the last decade (Klimchouk, 2007, 2009), the number of caves considered of hypogene origin in Italy has grown rapidly. Figure 1 shows the hypogene karst systems of Italy, including, besides the well-known and published ones, also the known and less studied, and presumed hypogene cave systems (see also Table 1).

More recently, in some of these caves detailed studies have been carried out including geomorphology, mineralogy, and geochemistry. Sulfuric acid caves are known from many regions along the Apennine chain (Tuscany, Umbria, Marche, Latium, Campania, Calabria) (Forti, 1985; Forti et al., 1989; Galdenzi and Menichetti, 1989, 1995; Galdenzi, 1997, 2001, 2009; Galdenzi et al., 2010; Piccini, 2000; Menichetti, 2009, 2011; Mecchia, 2012; De Waele et al., 2013b), but also from Piedmont, Apulia, Sicily (Vattano et al., 2013) and Sardinia (De Waele et al., 2013a). In this last region ascending fluids have also formed a hypogene cave in quartzite rock. Oxidation of sulfides can locally create hypogene cave morphologies in dominantly epigenic caves, such as in the Venetian forealps (this cave is not shown in Figure 1, being largely epigenic in origin) (Tisato et al., 2012). Ascending fluids have also created large solution voids in Messinian gypsum beds in Piedmont, and these can be defined hypogene caves according to the definition by Klimchouk (Vigna et al., 2010). Some examples of hypogene cave systems due to the rise of CO_2-rich fluids are also known in Liguria and Tuscany (Piccini, 2000). In the Alps and Prealps (Lombardy), some ancient high mountain karst areas exhibit evidences of an early hypogene origin, deeply modified and re-modeled by later epigenic processes. Hypogene morphologies are thus preserved as inactive features, and it is often difficult to distinguish them from epigenic ones.

At almost twenty years distance from the first review paper on hypogene cave systems in Central Italy by S. Galdenzi and M. Menichetti (1995), we give a review of the state-of-the-art knowledge on hypogene caves actually known from the whole of Italy.

[1]Department of Biological, Geological and Environmental Sciences, Via Zamboni 67, 40126 Bologna, Italy, jo.dewaele@unibo.it, cescosauro@gmail.com
[2]Viale Verdi, 10 Jesi, Italy, galdenzi.sandro@tiscali.it
[3]Department of Earth and Marine Sciences, Via Archirafi 22, 90123 Palermo, Italy, marco.vattano@unipa.it, giuliana.madonia@unipa.it
[4]Department of Earth, Life and Environmental Sciences, Campus Scientifico Enrico Mattei, Via Cà Le Suore, 2/4 - 61029 Urbino, Italy, marco.menichetti@uniurb.it
[5]National Research Council, IRPI, Via Amendola 122-I, 70126 Bari, Italy, m.parise@ba.irpi.cnr.it
[6]Department of Earth Sciences, Via La Pira 4, 50121, Firenze, Italy, leonardo.piccini@unifi.it
[7]Institute for Biometeorology, National Research Council of Italy, Traversa La Crucca 3, 07100 Sassari, Italy, l.sanna@ibimet.cnr.it
[8]Gruppo Grotte Milano CAI-SEM; Progetto Speleologia Glaciale, paolatognini@iol.it
[9]Department of Territorial Engineering, of the Environment and of Geotechnologies, Politechnical University of Turin, Corso Duca degli Abruzzi 24, 10129 Torino, Italy, Bartolomeo.vigna@polito.it

Table 1. Hypogene cave systems of Italy ordered in well-known (studied), known and presumed ones. For location see Figure 1.

Cave system	Studied	Known	Presumed
1 Valle di Scerscen		X	
2 Valmalenco		X	
3 N Grigna		X	
4 Tremezzina		X	
5 Lezzeno			X
6 Mt Fenera			X
7 Moncalvo	X		
8 Grotta della Guerra			X
9 Scogli Neri		X	
10 Monsummano	X		
11 Mt Pisani		X	
12 Tassare-Mt Nerone	X		
13 Mt Rotondo	X		
14 Mt Cucco	X		
15 Frasassi	X		
16 Faggeto Tondo	X		
17 Mt di Campiglia			X
18 Mt. Civitello	X		
19 Mt Cetona		X	
20 Roselle		X	
21 Montecchio	X		
22 Parrano	X		
23 Pozzi della Piana	X		
24 Triponzo	X		
25 Acquasanta Terme	X		
26 Cittareale		X	
27 Buco del Pretaro	X		
28 Mt Soratte		X	
29 Pozzo del Merro	X		
30 Subiaco		X	
31 Fiume Coperto	X		
32 Mt Lattari		X	
33 S. Cesarea Terme	X		
34 Capo Palinuro	X		
35 Mt Sellaro	X		
36 Cassano allo Ionio	X		
37 Terme Luigiane		X	
38 Phaff	X		
39 S. Barbara	X		
40 Corona ‘e Sa Craba	X		
41 Monte Inici	X		
42 Acqua Fitusa	X		
43 Mt Kronio	X		

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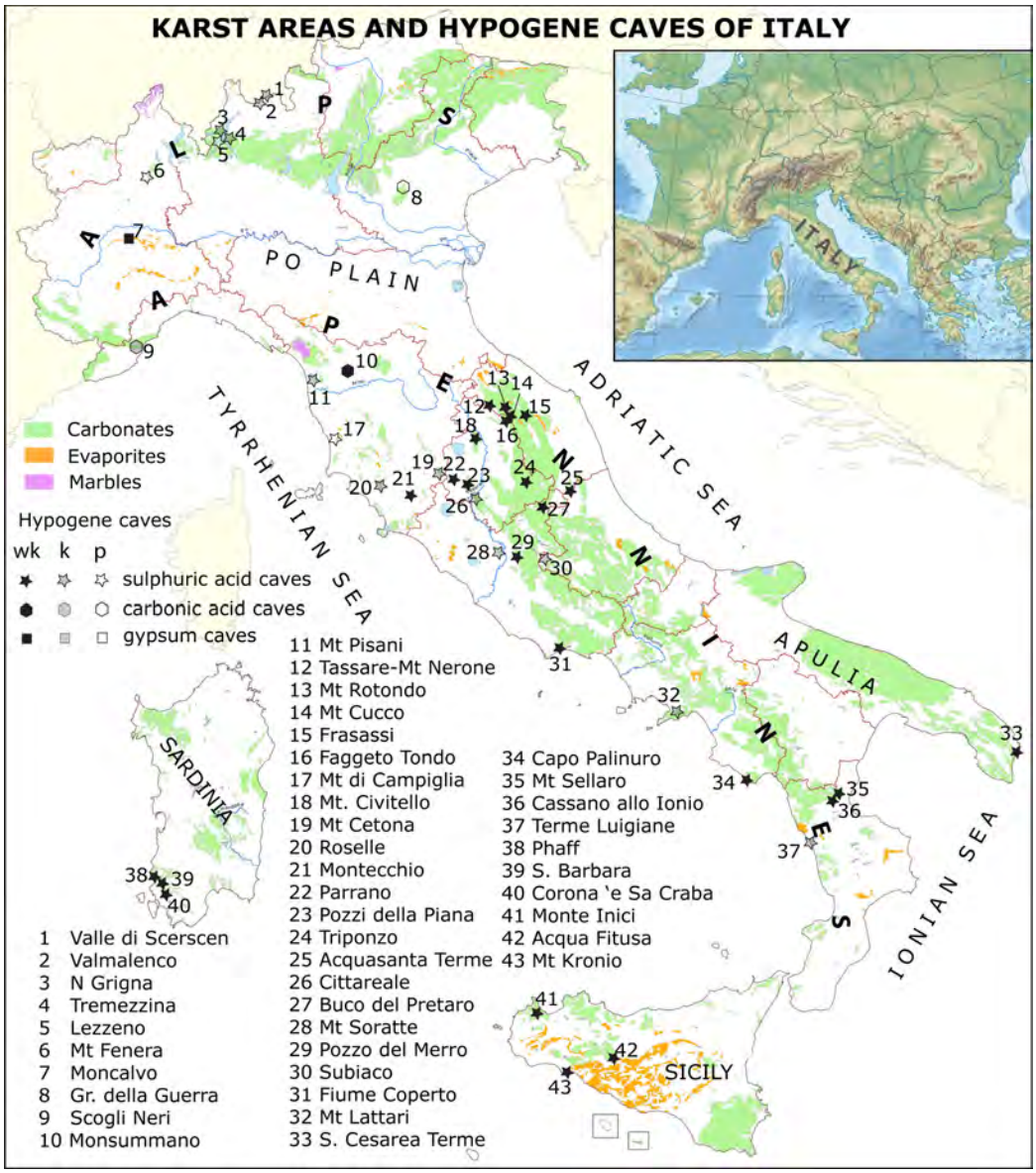

Figure 1. Italian karst areas and the hypogene karst systems (modified from Sivelli and De Waele, 2013, Speleologia 68, special issue printed for the 16th ICS Brno). wk = well known, k = known, p = presumed (GIS elaboration by M.L. Garberi).

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