

Morphology and evolution of sulphuric acid caves in South Italy

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Sulphuric acid speleogenesis (SAS) related to the upwelling of acid water enriched in H₂S and CO₂ represents an unusual way of cave development. Since meteoric infiltration waters are not necessarily involved in speleogenesis, caves can form without the typical associated karst expressions (i.e. dolines) at the surface.

The main mechanism of sulphuric acid dissolution is the oxidation of H₂S (Jones et al., 2015) which can be amplified by bacterial mediation (Engel et al., 2004). In these conditions, carbonate dissolution associated with gypsum replacement, is generally believed to be faster than the normal epigenic one (De Waele et al., 2016).

In Italy several SAS caves have been identified, but only few systems have been studied in detail: Frasassi and Acquasanta Terme (Marche)(Galdenzi et al., 2010), Monte Cucco (Umbria) (Galdenzi & Menichetti, 1995), and Montecchio (Tuscany) (Piccini et al., 2015). Other preliminary studies have been carried out in Calabria (Galdenzi, 2007) and Sicily (De Waele et al., 2016).

Several less studied SAS cave systems located in South Italy, and in particular in Apulia (Santa Cesarea Terme), Sicily (Acqua Fitusa, Acqua Mintina) and Calabria (Mt. Sellaro and Cassano allo Ionio) have been selected in the framework of a PhD thesis on SAS caves and their speleogenesis.

Using both limestone tablet weight loss (Galdenzi et al., 2012) and micro erosion meter (MEM) (Furlani et al., 2010) methods the dissolution rate above and under water in the caves will be quantified. Geomorphological observations, landscape analysis using GIS tools, and the analysis of gypsum and other secondary minerals (alunite and jarosite) (stable isotopes and dating) will help to reconstruct the speleogenetic stages of cave formation. Preliminary microbiological analysis will determine the microbial diversity and ecology in the biofilms.

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