

Multilevel karst system evolution in relationship to palaeo-climate and palaeo-geography: hints from a 500 ky speleothem record from the Piani Eterni Karst System, Belluno Dolomites, Italy

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Piani Eterni is the deepest and longest multilevel karst system of the Dolomites. The geometric distribution and stratigraphic-structural guidance of palaeo-epiphreatic levels have been studied in detail in recent times, but there are still several open questions regarding the palaeo-climatic and palaeo-geographic factors that have controlled its evolution through time.

Over the last three years, several stalagmites were sampled from different palaeo-epiphreatic levels in the karst system. The relatively high concentration of uranium in the dolomitized bituminous unit hosting the cave has allowed dating with high precision of stalagmites up to more than 500 ky old using the U-Th radiometric method.

All the speleothems have been collected from palaeo-epiphreatic conduits without vadose entrenchments at different altitudes (from 1650 to 860 m a.s.l.). The research has focused on speleothems that have registered different flooding events with intercalated sedimentation of silts and sands. These events could have happened only when the conduits were still very close to the epiphreatic zone and the speleothems formed directly after the formation and draining of the epiphreatic conduits. The temporal record of the speleothems and their vertical distribution in the cave, compared to the presence of fluvial terraces and glacial deposits in the nearby Mis Valley, are shown to be in agreement with the uplift rate of the region. The data obtained from the karst system and speleothem dating elucidated the geomorphic events and temporal constraints on a major fluvial capture of the Mis Valley toward the south, a hypothesis already proposed by previous authors.

Stable isotope records (oxygen and carbon) in the speleothems show that the favorable conditions for calcite precipitation were related to cooling and unstable periods following the interglacial apexes of MIS11, MIS 9, MIS7, and MIS5.

This is a prime example of studies of speleothems, of their palaeoclimate record and of their growth in relation with the formation of the hosting conduits and epiphreatic oscillations, bringing new insights on the evolution of multilevel karst systems.