Geophysical Research Abstracts,
Vol. 11, EGU2009-338, 2009
EGU General Assembly 2009

Evolution of karst in messinian gypsum (Monferrato, Northern Italy)

B. Vigna (1), G.F. Fioraso (2), J. De Waele (3), and C. Banzato (1)

(1) Dipartimento di Ingegneria del Territorio, dell'Ambiente e delle Geotecnologie, Politecnico di Torino, Corso Duca degli Abruzzi, 24 - 10129 Torino, Italy. E-mail: Bartolomeo.vigna@polito.it, (2) CNR-IGG, Via Valperga Caluso 35, 10125 Torino, Italy, (3) 3Italian Institute of Speleology, University of Bologna, Via Zamboni 67 - 40127 Bologna, ITALY. E-mail: jo.dewaele@unibo.it

In the Tertiary Basin of Piedmont (Northern Italy) an important Messinian sedimentary succession crops out, composed of pre-evaporitic clays, macrocrystalline gypsum beds with marly interbeds, a microcrystalline gypsum bed, redeposited gypsum and post-evaporitic lacustrine-marine fine sediments. In some places this sequence is disturbed and shows more or less extensive gypsum blocks embedded in fine impermeable terrigenous sediments, related to important gravitational resedimentation processes that have involved the entire evaporite succession from the end of Messinian to Plio-Pleistocene. Gypsum rarely crops out, and where it does it extends some hundredth of square meters only. These gypsum deposits have been quarried both at surface and underground and the entire evaporite sequence has been reconstructed on the basis of several boreholes carried out by the Fassa Bortolo S.p.A. In the Monferrato area the entire thickness of the evaporite sequence is extremely variable, between a maximum of 70 meters up to only a few meters, due to an important erosional surface that cuts the upper part of the Messinian series. This erosional surface has formed at the end of the evaporite cycle, when freshly deposited gypsum rocks were exposed undergoing an extensive karstification. The upper part of the sequence is widely karstified with the presence of several small and mostly vertical cavities, often developed along vertical joints and fractures close to the surface. At depth, mostly beneath the altitude of present thalwegs, a well developed system of active phreatic cave conduits has been discovered both by direct exploration from underground gypsum quarries and by boreholes. In the Moncalvo quarry these conduits reach a development of more than 1 km, with voids of 10 meters in diameter. Some of the known karst voids appear to have started forming during a short intra-Messinian phase of emersion. This hypothesis is based on three observations: 1) in many sectors of the area gypsum beds have been karstified although outcropping only rarely, most of the time composing a confined unit between Pre-Messinian and Upper Messinian-Pliocene impermeable beds of clay- and siltstones; 2) the fauna associations found in cave sediments, although partially remobilised, indicate a Burdigalian-Lower Pliocene age and would agree with a Messinian age of the voids they occupy. Their mobilisation with the Pliocene impermeable cover in place seems hard to defend; 3) the best developed karst conduits in gypsum have been discovered well below the present valley bottoms, and their genesis is difficult to explain in a phreatic situation between two impermeable beds. These voids have probably formed above local base level during the intra-Messinian uplift period.