3D laserscanning and geomorphological studies in Orgnac cav **(Ardèche, France)**

Stéphane Jaillet [1], Elisa Boche, Benjamin Sadier, Estelle Ployon & Jean-Jacques Delannoy
[1] Laboratoire EDYTEM, Université de Savoie, CNRS,
Pôle Montagne, 73 376 Le Bourget du Lac, France
stephane.jaillet@univ-savoie.fr

Recent laserscanning techniques can revisit the geomorphological analysis methods traditionally used in caves. Indeed, laser scanning offers very high resolution topography. Very large point clouds are acquired and after consolidation, meshing and processing, analyzes on the 3D models can be performed. This type of approach is particularly interesting in cavities where size or conservation issues are important. This is the case of Orgnac, a major French tourist cavity, the only cave ranked "Grand Site de France".

Three examples of 3D geomorphology studies illustrate here the relevance of this approach. (1) The gigantic underground volumes did not allow direct observation of all parietal morphologies. A 3D reconstruction of the «Salles rouges» chamber permits the identification of bench-marks on the 3D model. These works give us a reconstitution of the sedimentary aggradations during Pliocene. (2) A forest of stalagmites tilted was protected for conservation reasons and access restrictions. Again the construction of a 3D model and some informatics developments gave us automatic mapping to study in their environment the geometrical characteristics of 140 stalagmites. Finally (3), a detrital fan is currently being excavated for archaeological studies. This excavation destroys irreparably a side of this unique underground archive. Site supervision by LIDAR offers at each stage of the search, a topography, which is a very fine memory of the deposit. In addition, 3D reconstruction and analysis of sedimentary structures provides information about its genesis.

Through the diversity of these three examples, we measure the value of this type of analysis on 3D model to better understand underground morphologies. The implementation of this approach in tourist cave also offers an additional opportunity: the scientific mediation to the public, eager for this type of 3D production with many possibilities of representation.

Scientific researchs in Orda and Kungur Ice Caves

Olga Kadebskaya [1] & Maximovich N.
[1] Mining Institute of Ural branch of Russian Academy of Science, 78a St. Sibirskaya, Perm, Russia, 614007, icecave@bk.ru

The Kungur Ice Cave drew attention of numerous researchers from XVII century. In 1948 the karst and speleological station was organized. Researchers started to observe the cave systematically as well as study karst processes in the Ural territory. 100-year anniversary of scientific and excursion activity in the Kungur Ice Cave will be in May, 2014. Today the Kungur Ice Cave is one of the few caves in the world and unique in Russia in which for 60 years complex scientific supervisions are carried out.

Studying of the Orda Cave began in March of 1994 after opening of its underwater part. Today it is the most extended underwater cave of the world in sulphate deposits. Research team together with speleodivers developed a special technique of underwater karst researches. Studying of the Orda Cave included a complex of researches under water and on an earth surface. Under water it was groundwater flow observation, photography, camera shooting and also water, rocks and bottom sediments sampling. Studying of karst forms, hydrochemical sampling of surface water etc. was carried out at the surface. Further the Orda Cave at the organization of continuous supervision in an underwater part can become the interesting range for further karst processes studying.

The structural, textural and mineralogical rocks characteristic in the Kungur Ice Cave and their transformation at karstification

Tatyana Kalinina, Mining Institute of Ural branch of Russian Academy of Science, 78a St. Sibirskaya, Perm, Russia, 614007, tatyanaak89@mail.ru

The Kungur Ice Cave is created in the interlaid karst carbonate and sulphate rock mass of Ledyanaya Gora upland. Section studying in the grottoes allowed to reveal two stages defining structural and textural rock features, they are sedimentary and diagenetic and also hypergene ones. The rhythmic interlayering of carbonate and sulphate deposits testifies to alternation of period interchange of increase and decrease of water mineralization in evaporate basin. There was dolomite precipitation at decrease of a water mineralization and inversely – sulphate deposits. The main hypergene processes were anhydrite hydration and subsequent gypsum dissolution. These processes were followed by the carbonate rock changing such as a desalination, recrystallization and reprecipitation of material. Freedom from impurities in carbonate minerals, fluorite and manganese oxy hydroxides presence testifies their formation in low temperature and oxidizing conditions at the expense of a hypergene reaggregation of initial carbonate rock elements.

It is supposed that the calcareous components desalination from dolomite layers and gypsum dissolution along intergranular boundaries on sites of a high fracturing of carbonate-sulphate layers led to organ pipes formation and filling of subjacent cavities by collapse-breccia. Such nature is supposed for dolomite and gypsum breccias in the Morskoe Dno Grotto and transition from the Ruins Grotto to the Corallovy Grotto. Possibly such rocks mark cavities position of the Great-Kungur Cave.

Significance of water research in show caves

Janja Kogovšek
IZRK ZRC SAZU, Titov trg 2, 6230 Postojna, Slovenia, kogovsek@zrc-sazu.si

In karst caves water drips from the cave ceiling and in the majority of cases deposits calcium carbonate, which builds calcite decorations. Continuous measurements of precipitation on the surface, which then flows through the cave ceiling (vadose zone), and measurements of physical