

O14-4**SEISMOGEOENVIRONMENT PROBLEMS OF PROTECTED BY
UNESCO MONUMENTS IN NE BULGARIA****MARGARITA MATOVA**

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Introduction

The most important monuments of the First Bulgarian Kingdom and some remarkable monuments of the Second Bulgarian Kingdom are placed in NE Bulgaria, in the surrounding of the three state capitals: Pliska, Preslav and Veliko Tarnovo. A part of the monuments are protected by UNESCO.

The study territory is under the strong influence of the regional and local earthquakes with $M \geq 7$. The seismic effects are destructive for the historical and archaeological monuments.

Seismogeoenvironment of the protected by UNESCO monuments***Horseman of Madara***

One of the most representative historical monument from the First Bulgarian Kingdom is the Horseman of Madara (VIII c.). The monument was sculptured in the Cenomanian calcareous sands of the western vertical slope of the Madara Plateau. The slope is high and very representative. The place of the monument is in a relatively the less fractured part of this slope.

This slope is a subject of the processes of the weathering, the karstification, the block fragmentation, the rockfalls, landslides and some earthquake deformations.

Some local strong historical earthquakes are marked by archaeologists. The seismic movements provoke remarkable deformation of the rock massif. Several generations of rockfalls and landslides are causing the large distribution of big blocks of calcareous sands at the foot of the slope. The tectonic processes, including the earthquakes, are causing the formation and the opening of the numerous fractures and faults in the locality.

The block with the sculptured Horseman of Madara is cut also by certain fractures. Their progressive opening is a subject of the monitoring study and analysis. The fracture evolution is taken in account for the planing and realization of the next conservative works.

Ivanovo rock church and Aladja monastery

The big monastery complex, situated to the S and SE of the Rouse city (so named Bulgarian rock Aton), and the Aladja monastery, placed to the NNE of the Varna city, are very attractive traces of the Second Bulgarian Kingdom and of the Bulgarian Renaissance.

The Bulgarian rock Aton has included a lot of monasteries in the Rouse city surrounding. A part of the monasteries were developed in Lower Cretaceous limestone. The Ivanovo rock church is a part of this monastery complex in the vicinity of the Rouse city. The church is protected by UNESCO. The Ivanovo church is cut by several fractures, but one of them creates a very danger situation.

The Aladja monastery, of the surrounding of the Varna city, was sculptured in Neogene limestone. The monastery is placed in a fractured slope of the Frangen Plateau. The Aladja monastery is also protected by UNESCO.

The walls and the ceilings of the Ivanovo church and of the Aladja monastery are covered by remarkable icon images, doing by the best representatives of the famous Veliko Tarnovo art school in the XIV century. The icon images are of a big importance for the national and world art history of the Middle Age.

The considerable part of the above mentioned monasteries are cut in the most representative and high vertical slopes of the rock massifs. The slopes with the sculpted Ivanovo church and Aladja monastery are the subject of faulting and block fragmentation. Some rockfalls are presented at the foot of the slopes in the localities of the investigated monuments.

The limestone in the localities of the Ivanovo church and the Aladja monastery is also eroded and karsted.

Seismic influence in the region

The strong regional and local earthquakes have a very significant influence in the study territory. The numerous regional Vrancea earthquakes with $M \geq 7$ provoke certain of the most destructive effects in the North-Eastern Bulgaria, including in the investigated monuments. The local seismic events with high values of magnitude characteristics ($M \geq 7$) are also taken in account. The I c. BC Bizone earthquake (in the vicinity of the town of Kavarna), the 543 and the 1944 Varna ones, also the 1901 Shabla earthquake had from limited (for the Horseman of Madara and the Ivanovo church) to strong (for the Aladja monastery) influence to the NE Bulgaria region.

The combination of the recent tectonic activity with the other geological manifestations creates a considerable danger for the protected by UNESCO historical and archaeological monuments. The long-term influence of the numerous geological processes with the destructive consequences, especially of the seismic ones, must be taken in account in the planing and realization of the next conservative works.

Conclusion

The protected by UNESCO monuments need a geological research and monitoring, seismotectonic investigations and a special attention during the realization of the human activities.

Now the geological and the seismotectonic studies in the monument regions are very limited. The geoenvironmental research is only in the beginning. It is very well, that the monitoring of the fracture evolution in the locality of the Horseman of Madara is realized during the last years.

The accumulation of geological knowledge and the creation of traditions in their using for the protection of the historical cultural monuments is one of the most important mission of the geologists, the seismologists and the historians.