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Environmental effects on the Monasteries of Mount Athos; the case of Symonos Petra Monastery

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The Monastery of Symonos Petra, located in Athos mountain (Greece) was studied for geotechnical site investigation and building material weathering conditions. The site investigation comprised rockmass description and rock slope stability analysis. The interpretation of the collected data determined the probable surfaces of sliding that can be activated under specific conditions. Building stones and different types of mortar, used as cementing material, were collected from the older parts of the Monastery (13th and 16th century). These samples were examined regarding their origin so as the most suitable measures for preservation may be taken.

INTRODUCTION

Construction material weathering, and foundation rock stability conditions are of particular interest, especially in regions like the Mediterranean Basin, where climatic and active geotechnic conditions are favourable.

Building stones are susceptible to various atmospheric factors causing their destruction. The presence of harmful soluble salts in pore water, as a result of the reaction of atmospheric gases with rock minerals, is one of the main factors of stone decomposition, especially in coastal areas.

On the other hand, most historical buildings were built without the geomechanical particularities of the construction area having been taken into consideration, in advance. Furthermore, the active neotectonic and seismotectonic conditions in the Mediterranean Basin change the stability conditions of the area where the monument was built.

Mount Athos is located in northern Greece and belongs administratively directly to the Patriarchate of Konstantinople. It is an area of great historical and religious interest, where only monasteries for men are built. Many, probably active, neotectonic faults, of N–S and E–W directions, traverse the area, causing damage to the monasteries.

The Monastery of Symonos Petra was selected for investigation as a pilot monument in the area, because it can be considered as an example of great scientific interest (Fig. 1). It was built around 1257 AD, on an isolated and uplifted rock (altitude 305 m) at the S/SW site of the mountain. It was burnt down several times, so as only the lower parts of the construction, near the rock base are still of that age. The western part of the present building was built in 1590 AD while the eastern part was built in 1890 AD. The tower at the shipyard of the monastery was built in 1563 and no restoration activities have been done until today.[1,2]

The monastery was investigated with regard to the slope stability of the construction area as well as the weathering conditions of the older mortars, that constitute the cementing material of the building stones and the critical factor of masonry strength. A part of the data used in the interpretation was presented in STREMA-93.[3]

The foundation area was investigated by means of rockmass classification and slope stability analysis. The interpretation of the collected data determined the probable surfaces of sliding that can be activated under specific conditions and loading. The activity of important discontinuities was also investigated, with