

Geology of The monastery complex of Vardzia and natural hazards

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The rock-hewn Monastery complex of Vardzia is situated in Samtskhe Province on the left bank of the river Mtkvari, near the Georgian-Turkish state border at an altitude of 1500 meters above sea level. The Monastery complex was cut into soft volcanic rocks during the late 12th and early 13th (1156-1203) centuries. It is a unique monument of the Georgian architecture.

The Vardzia monastery complex and its adjacent territory is built up of volcanogenic and volcanogenic-sedimentary formations, known as "Goderdzi suite". It is dated from the Late Miocene to the Early Pliocene.

The Vardzia monastery complex is hewn into pyroclastic sub-suites, so-called tuff layers of "Vardzia type". The microscopic analysis shows a variety of fragments in Vardzia-type tuffs: crystalloclastic, lithoclastic, vitroclastic and mixed varieties. They are known as ignimbrite. The Vardzia tuffs are covered by tuff breccia of andesite and dassic composition.

The Vardzia monastery complex has been endangered for centuries and is still at risk of destructive endogenic (earthquakes, tectonic movements) and exogenic (wind, climate, mechanical weathering /with sharp changes of temperature/ heavy rains, melting snow, and rivers, etc) geological processes. The monastery complex is located in a seismically active region zone. The 1923 earthquake destroyed 2/3 of the total area. Of danger are steep plateaus, which are built from tuffbreccia suites and are partitioned by cleft segments and erosive valleys. The erosive processes cause selective depletion of suite forming nonhomogenous rocks, which accelerate decomposition process of sustainability and balance of the valley. This creates real conditions for landslides and avalanches. A special attention should be paid to the dynamics of chemical processes in the tuffs of the Monastery complex. As a consequence clay /montmorillonite/ is formed, which significantly weakens the rock structure and makes a real precondition for tuff desintegration.