Archaeological excavations and extraction of information about ancient earthquakes

Археологически изследвания и извличане на информация за древни земетресения

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During the last several years specific targeted investigations in Bulgaria to the recognition of ancient strong earthquakes and their effects to the archeological excavations discovered many new and unexpected findings.

The new established discipline called Archaeoseismology is among the advanced techniques about ancient earthquakes identification (Ranguelov, Bojkova, 2008).

5400 BC, the Neolithic people started to produce salt to meet their needs, at a place near Provadia – NE Bulgaria. A large salt body rediscovered recently in 1917 served as a source of huge salt production. A prehistoric "factory" produced the most valuable item in ancient times – the salt, the most important and vital product of the early farmers. This unique site in Europe excavated by the team of Prof. Vassil Nikolov (Рангелов, 2009) shows the history of this place. Huge industry for this prehistoric period was developed and functioned for more than 1000 years. Thick walled pots and hearths for the brine evaporation have intensively been produced and can be seen now.

A prehistoric earthquake occurred about 7000 years ago destroyed the Chalcolithic dry-stone fortifications built up by the ancient salt producers. Thus, this seismic event probably interrupted for some time the salt production. A lot of facts, evidences and a hypothesis about such an event are presented to support this conjecture. This event appears as the most ancient European earthquake documented by archaeological findings.

An extensive research about this seismic influence has been performed. Attenuation curve based on the effects of other strong earthquake (31st March, 1901, M~7.0) has been plotted, thus appearing as calibration about the magnitude evaluation of the ancient earthquake. Different models of the destroyed fortifications have been explored. Collected data and results obtained support strongly the observed facts and conclusions about the influence of the seismic events to the life of the ancient salt producing people. The most probable candidate for the source of this very strong earthquake appears Shabla-Kaliakra seismic zone.

This seismic source affected many years later (in VI century AD) the well preserved Cybele temple in Balchik (SE Bulgaria) excavated in 2007–2008 (Ranguelov et al., 2008). The temple has been affected by a complex destructive event – earthquake, tsunami, landslide and this is clearly expressed in the archeological discoveries.

The field and labs investigations of the materials found inside and outside the temple have been used for the detailed study of the investigated case.

The methodology of the reconstruction of the events led to the destruction of the temple is based on the space relationships of the discovered natural and man-made findings:

– Sea sand layer mixed with red bricks on the floor of the temple. The layer is about 10–15 cm with black color composed by the burned material (most probably – wood). The mollusks shells (well preserved, but fragmented) have been discovered in the layer. The most preserved parts are from the most popular Black Sea mollusk – *Mitilus galloprovincialis*.

– Above a lot of fragmented and/or preserved marble artifacts (statues of the Cybele goddess, the frontone, big bowl, semi-columns, etc.) are located in the soil filling the temple space. Some of them keep their original positions (for example chairs), some are broken (like the marble plate with inscriptions) and some are preserved statues, bowl, etc. All these artifacts are mixed before being buried.

– After the diggings the preserved walls built up from stones and bricks could be seen in a very spe-

cific position – the preserved parts are cut off like by e scissor – all keep the same level. Under the walls the basement consisting of big stones is also preserved. The walls to the south and east are cracked and the bricks moved up-down. These movements could be generated by earthquake vibrations and/or landslides.

The application of the developed methodology of temporal reconstruction described above helps us to promote a possible scenario of the final moments of the temple's life.

The most logic chain of events looks like:

– Burning phase. Possible fire of the roof could be triggered by the burning rituals, earthquake which could trigger fire from the hall of the temple to the roof. It seems clear that the roof (probably built up of wood) burned and collapsed on the floor. This hypothesis is supported by the black layer and the red bricks found on the floor. The time of the fire is not possible to be identified.

– Very soon after the fire, the floor had been flooded by sea water bringing the sand and shells. The sand comes from the sea and has typical sea origin. The grains, composition and the shells of mollusks support this hypothesis.

– It is very probable that this local tsunami had been generated by an earthquake. The list of known earthquakes leads to that one in 543 AD. The effects of this earthquake could be the cracks visible on the walls on east and south segments. The fallen and broken marble plate with the written inscription is fully reconstructed – no missing parts, which means that this plate fell down and had been broken at once, and then immediately buried.

– Then the whole temple had been buried under the layer of deposits, also brought at once, because the whole lower part of the temple with the artifacts and the walls are totally preserved. The most probable explanation is that this burial process is due to land sliding or some not very fast, but also not very slow process (like erosional deposits for example). That is why these parts (from the walls and the marble) have not been used for some kind of further constructions around the temple (as the ancient practice was). The burial process had been enough fast to preserve the walls and artifacts, and not enough slow to the same reason. The only natural process with such physical characteristics could be a landslide, which also had added its force for the mixture of the artifacts inside the space of the temple. The area is famous with active landslides of Pleistocene age and the materials inside the temple are absolutely similar to the surrounding materials sliding down permanently.

Another seismic source probably affected the Thracian tomb and temple in Starosel – Central South Bulgaria – located in the Plovdiv active earthquake zone. Many evidences like broken and horizontally moved marble beams, cracks and sheet-like wall stones destructions also support such a hypothesis (Kovachev et al., 2002). The hypothesis about the temple's destruction by an ancient earthquake however was excluded. Most probably, here the reason is the human influence (according the ancient Thracian tradition the conquerors were destroying temples and tombs of their enemies, believing that such way they can not fight them again because their forces are eliminated), but later the temple has been influenced by a strong earthquake – may be after its destruction.

Bulgaria with its rich cultural heritage and active seismic sources appears as a promising place about ancient earthquakes documentation due to the numerous archaeological findings.

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