

Unknown hidden earthquakes in the Troy, Mikri Doxipara-Zoni (Evros), Helike faults: an Archaeoseismological approach

Spyros Pavlides, Professor of Geology,
Aristotle University of Thessaloniki

ABSTRACT

“Demetrius of Callatis (c 200 BC) describes natural disasters ... and all the earthquakes that have ever occurred in the whole of Greece...”. Strabo

Paleoseismology is a new subject of Geology that deals with extracting information about prehistoric and historical earthquakes based on geological data (microstratigraphic analysis, sediment dating, tectonic structures, subsidence, etc.). Systematic archaeological and archaeoseismological surveys, as well as geological – palaeoseismological studies try to find evidence and proofs for historical earthquakes associated with destroyed buildings and towns. These efforts are being made, in order for the modern scientists to come up with conclusions useful for the evaluation of seismic hazard. Some of the most representative examples of modern archaeological – palaeoseismological research from Troy (NW Turkey), Helike (Achaia), and Mikri Doxipara-Zoni (Evros), are presented in this review paper.

The problems of the geomorphological evolution of Troy plain during the middle – late Holocene (Bronze Age mainly) examined. Also, all the new data of the alluvial plain morphology of the rivers Scamander (Karamenderes) and Simois (Dümrek), the nature, the structure and the utility of the Keşiktepe artificial channel and mainly the neotectonic faults of the Troy plain will be mentioned. Special emphasis is given on the study of the normal fault of the northern hillside of Troy (Hisarlik-Tevfikiye-Kaştepe). Its morphotectonic characteristics, its level of activity and the interaction with the riht-lateral North Anatolia Fault System were studied. The possibility to be responsible for a disastrous earthquake during the end of the Bronze Age (ca. 12th century BC) as the archaeological data evidence for Troy VI. This study was proceed in the framework of bilateral Greek-Turkish co-operation with the Onsekiz Mart Çanakkale University (Tutkun S.Z., et al., Kürçer A. et al.).

Trench stratigraphy and morphotectonic analysis was used to examine the Helike (Eliki) fault, which is associated with the catastrophic earthquake of 373 BC, as well as of the 1861. The entire alluvial plain of the Kerynites and Vouraikos rivers, which cross the Eliki fault, has subsided at rate of 1.4 mm/year, resulting in the burial of the Late Hellenistic-Roman occupation horizons under 3 m of fluvial and colluvial sediments. Along the eastern segment of the Eliki Fault five trenches have been excavated and their 5000-yr old fluvial and colluvial deposits have been studied in association with the fault strand imprinted on them. Sedimentation in the alluvial plain and the fluvial geomorphology of the Kerynites River is important for understanding the fault evolution and

the burial of the ancient (4th c. BC) Helike town (Collaboration with the Department of Geology, University of Patras, Koukouvelas et al.,).

The Mikri Doxipara-Zoni tumulus of 2nd c AD has been found to have been deformed by a set of active faults, associated with a recent earthquake (s). The paleoseismological study of the site was performed in order to quantify the data and analyze the geological structures associated with those faults. The excavation site has been deformed by two seismic events: The ultimate one caused the deformation of an altar and created surface ruptures up to 90 cm displacement. As this is a historical earthquake, postdating the construction of the altar, it can only be associated to the 1752 event that caused extensive damage of nearby Edirne (Hadrianoupolis) and is the only reported strong earthquake in the area. Up to now, there have been some uncertainties regarding the location of the seismogenic fault. The penultimate event took place between 960 BC and 2nd century AD, based on radiocarbon dating of a paleosol that has been deformed by a normal fault. This earthquake is not reported in any historical records, and therefore we consider this an important contribution to knowledge of the seismicity of the area. (Collaboration with the D.Triantaphylos archaeologist-excavator).