

## **Mycenaean Tiryns and the Earthquake Hypothesis: Summary of Results from the HERACLES Project**

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In the 1980s several findings in the most recent archaeological excavations at Mycenaean Tiryns in the Argive Basin, Peloponnese, led the excavator to interpret undulating and inclined walls, fallen pottery, and human remains as signs of a devastating earthquake that destroyed the palatial buildings and other constructions within the Tiryns citadel. It was even speculated that this natural disaster dated to 1200 to 1190 BCE could have been a contributing cause for the decline of the Mycenaean civilization, and later by others that this event was part of a 50-years-lasting 'earthquake storm' in the Eastern Mediterranean.

In a comprehensive study we collected new geophysical data at the archaeological World Heritage site of Tiryns and its surroundings to study local earthquake site effects. We reviewed the archaeological evidence and excavation photos, used laser scans to further explore damage patterns in constructions including the massive Cyclopean fortification walls. P- and S-wave refraction tomography, HVSR single station measurements and noise recordings with 10-station arrays allowed to model the site effects and compare these with standard spectral ratios of onsite recorded local earthquakes. While the shallow double limestone knoll of Tiryns, which contained the Mycenaean palace and carries a massive Cyclopean fortification wall, shows only small site amplifications below a factor of 2 at frequencies between 2 and 10 Hz, the soft sediments in the surrounding area, where the peasant residences were located, show amplifications of 4 to 6. However, no earthquake damage in the Lower Town has been archaeologically documented so far. Synthetic site specific seismograms for earthquake scenarios including sources at the Hellenic subduction zone and the Patras-Corinth rifting zone do not support the earthquake hypothesis and a reactivation of local faults of the Argolis is doubtful.

Several aspects of the previously presented 'earthquake evidence' could be shown to be erroneous or not compatible with quantitative modeling, as in case of the fallen pottery and earthquake induced fatalities. Some of the described damage can be well explained with natural decay processes such as earth pressure and weathering by root pressure. It is clear that the site has been shaken by several earthquakes in its 3500 years of history; however, it is unlikely that a devastating earthquake destroyed the Mycenaean structures at Tiryns around 1200 BCE.