

# RECENT COASTAL CHANGES IN THE NORTHERN LAONIC GULF, GREECE, BASED ON GEOMORPHOLOGICAL AND ARCHAEOLOGICAL EVIDENCE

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## Abstract

The Laconic gulf is located in southeastern Peloponnesus and is characterized by intense seismicity with many strong disastrous earthquakes reported since ancient times. Moreover the gulf forms an asymmetric graben situated between the mountain masses of Parononas in the east and Taygetos in the west, showing signs of active tectonics. On both sides of the Laconic gulf, submerged archaeological remains from Classical to Byzantine times have been observed in the sea as deep down to 5m. Detailed coastal geomorphological mapping was performed in relation to the location of archaeological sites, in order to determine whether eustatism or tectonism, is primarily responsible for their submergence.

*Keywords: Tectonics, Geomorphology, Sea level, Coastal process, Aegean Sea*

## Introduction

The study area, located in southeastern Peloponnesus, extends along the shores of the northern Laconic gulf (Fig. 1). Geomorphologically the broader area of southeastern Peloponnesus have been studied by several researchers (1,2,3). Morphotectonically, the gulf and its northern extension form an asymmetric graben situated between the mountain masses of Parononas (1935m) in the east and Taygetos (2407m) in the west. Regarding the tectonics, step like normal faults having NW-SE directions and dipping to the NE are observed in the west, while in the eastern part the big normal fault of Molai with a NE-SW direction and a SE dip exists. The morphological and the archaeological observation suggest that these faults have been reactivated in historical times. Moreover the area is characterized by intense seismicity, as strong disastrous earthquakes have been reported since ancient times, indicating recent tectonic activity.

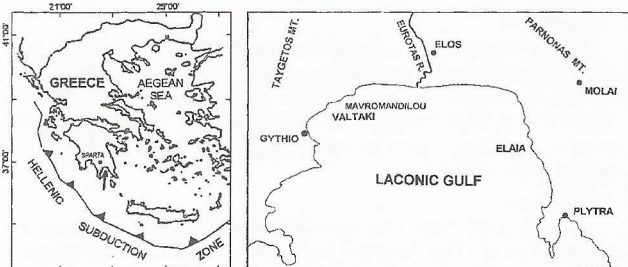


Figure 1. Location of the study area within Greece and main localities discussed in the text.

On both sides of the Laconic gulf and especially in the area of Plytra in the east and at Gythio, Valtaki and Mavromandilou in the west (4,5), submerged archaeological remains from Classical to Byzantine times have been observed in the sea as deep as 5m. Furthermore, 3km inland from the the mouth of Eurotas river at the head of the Laconic gulf, archaeological reports indicate the existence of the port (Elos) of the ancient city of Sparta (6). In the present study, detailed coastal geomorphological mapping was performed in relation to the location of archaeological sites (Fig. 2), in order to determine which of the two factors, eustatism or tectonism, is primarily responsible for their submergence.

## Archaeo-geomorphological observations

Gythio, the harbor of ancient Sparta was in use since the Homeric times and served the hinterland till the Roman times. Although several earthquakes shook the town the worst one happened in 375 A.D. and the sea covered a considerable part of the town. Nowadays submerged ruins are observed down to 5m depth. Valtaki, In the Holocene, following the stabilization of sea level around 5000 BP, the E-W flow of the longshore drift formed a sand spit which extended westwards resulting to the formation of a small lagoon behind it. Eventually, the fluvio-torrential sediments filled most of the lagoon leaving a small marshy area. In the western part of the sand spit, near the springs (Glyfada), Roman and early Byzantine ruins extend into the sea down to a depth of about 2m. Over them, coastal dune fields have developed reaching to an elevation of about 4m. The most recent formation is the beachrock which covers the archaeological remains and is located in the present intertidal zone but eroding today. In Plytra, part of the classical city of Asopos, is submerged at depths of around 2m. The overlying Roman and early Byzantine ruins at above present sea level.

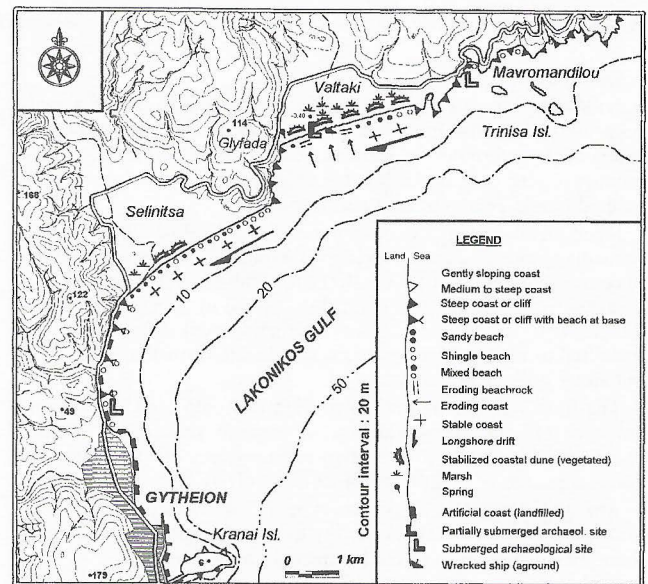


Figure 2. Coastal geomorphological map of the study area

## Conclusion

It is evident that this area has been submerged in recent times, but is it still difficult to distinguish the proportional contribution of eustatism and tectonism. However archaeological sites of the same age has not submerged with the same rate. Ruins of Classical time at Gythio in the west are found much deeper (5m) than in Plytra in the east (2m), indicating tectonism is much more significant factor in the relative sea level change in the last 2000yrs. The reactivation of local normal faults has played the predominant role. The plane of Eurotas evolved differently because of the important sedimentation of the Eurotas river.

This study shows that geomorphological mapping combined with archeological observation could provide valuable conclusions concerning the recent geomorphological evolution of the area.

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