

## **Tales of some ancient harbors in the Aegean back-arc region: Earthquakes, coastal changes, historical impacts**

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Tectonically active terrains are characterized by seismic transient ground motions (shaking) and by permanent ground motions in the vicinity of activated faults, with both effects occasionally leaving their signature on human constructions and the landscape. Especially in coastal areas marked by small tidal ranges and normal water salinity, as is the case with most parts of the Eastern Mediterranean, even small-amplitude tectonic motions can be derived from observations on coastal constructions, mainly harbors, but also on spring chambers in nearly arid environments, sewers, etc. Such observations, if coupled with well-dated observations of destructions and repairs and of changes in the occupation style of ancient sites can permit precious information conveyed from archaeology to tectonics/seismology and vice versa.

A transect with harbor remains from Rhodes to the Gulf of Corinth and then till the Ionian Islands provides some excellent examples. The military harbor of Rhodes, in an area of long term uplift, a coded report of which seems to be provided by ancient poet Pindar, was subject to seismic subsidence and destruction, but with major international support, it was repaired, till renewed uplift brought it several meters above the water. In the Corinth area, the Kenchreai harbor was abruptly submerged during a major repair of a temple, as revealed by precious stained glass panels, ready to use but abandoned in shallow water beneath ruins, while radiometric dating of the uplift in the western Lechaion harbor, constrains its excavation in swampy environment not in Roman times, but to the period of flourishing of Corinth in circa 600BC and the colonization of Italy. Farther west, the sea-level mark of the harbor of Aigeira, at Mavra Litharia (Derveni/Akrata) indicates 4m uplift since the Roman period, at least partly seismic, correlating with an exposed reef and the abandonment of the repairs of the theatre of Aigeira. Seismic land uplift explains the demise of this ancient town since approximately AD200 as a result of loss of the only significant harbor along the southern coast of the Gulf of Corinth. Farther west, in the south part of the Greek mainland, rising of the level of the dock shortly after its construction may imply response to seismic land subsidence, while at the nearby harbor of Palairos, remains of a submerged breakwater, offset by several meters, testify to strike slip faulting with seismic offset amplified by liquefaction.