Puglia 2003 - Final Conference
Project IGCP 437

Coastal Environmental Change
During Sea-Level Highstands:
A Global Synthesis with implications
for management of future coastal change

Otranto / Taranto - Puglia (Italy) 22-28 September 2003
Quaternary coastal morphology and sea level changes

Project 437

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Steady uplift or alternations of tectonic uplift and subsidence in raised beaches? Evidence from late Holocene shorelines of Rhodes Island (Greece).

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Keywords: *Uplift, subsidence, Rhodes Island, ancient ramp*

Abstract

It is usually assumed that Quaternary raised beaches originate from a combination of sea-level oscillations and a steady, nearly continuous or step-like seismic uplifts. However, in the case of Crete (Aegean Sea), as well as of other areas (Indonesian Arc; Perachora Peninsula, Greece, etc.), it has been shown that tectonic movements involve both uplift and subsidence. A similar result has been obtained from the analysis of biological and geomorphological observations and laboratory analyses of the NE coasts of Rhodes Island (Greece). New evidence refining these results is presented here. Archaeological excavations brought to light remains of an ancient ramp used to pull ships to shipsheds, which were known to have been destroyed by an earthquake at *circa* 227BC.

This ramp corresponds to a sea-level ~2m higher than present, in agreement with the trend of tectonic deformation of the area deduced from uplifted Holocene notches. The particularity of this ramp is that it consists of two parts, the original ramp, and an about 1m layer built on top of it, obviously to counteract a relative sea-level rise. The subsidence of the ramp is dated by archaeological and historical data to around 227BC, in agreement with AMS analyses of marine shells found on the remains of this ancient structure.

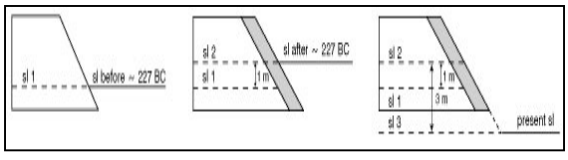

Figure 1. A cartoon to explain relative sea-level changes and coastal uplift and subsidence in Rhodes, deduced from the study of an ancient ramp, used to pull ships to the shipsheds of the harbour of the ancient town. Shaded is the layer of blocks added to counteract relative sea-level rise after the 227BC earthquake.

At a later period, a series of uplifts brought the ramp ~3m above the water. Structural data and elastic dislocation modeling of the cumulative Holocene uplift indicate that the raised beaches of the NE Rhodes coast are due to thrusting, and that the alternation of uplift and subsidence is probably a result of shifting of the activity among faults of the same fault-zone; such faults were associated with earthquakes with minimum magnitude 7.5-8.0.

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