

## LATE HOLOCENE RELATIVE SEA LEVEL CHANGE IN MALTA

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ABSTRACT: Biolchi S. *et al.*, *Late-Holocene relative sea level change in Malta*. (IT ISSN 0349-3356, 2011)

A multidisciplinary approach has been used to evaluate the Late-Holocene relative sea-level change in Malta. Published data, together with new coastal underwater observations of archaeological sites have been compared with predicted sea level curves, to evaluate the relative sea level change.

RIASSUNTO: Biolchi S. *et al.*, *Variazioni tardo-oloceniche del livello marino a Malta*. (IT ISSN 0349-3356, 2011)

Le variazioni tardo-oloceniche di livello marino sull'isola di Malta sono state studiate attraverso un approccio multidisciplinare. La comparazione tra una serie di nuove misure sulle quota di alcune strutture archeologiche costiere sommerse, l'utilizzo di dati pubblicati e le curve ottenute dai modelli hanno permesso di delineare una prima indicazione sulle variazioni di livello marino dell'isola.

Key words: sea level change, late-Holocene, geoarchaeology, Malta

Parole chiave: variazioni di livello marino, tardo-Olocene, geoarcheologia, Malta

Late-Holocene relative sea level changes have been well-detailed along the Mediterranean coasts. Until now, few archaeological or geomorphological data have been considered to evaluate sea level changes along the Maltese coast, although both the geomorphological evolution and the development of coastal settlements could provide useful information on the active tectonics (uplift or downlift, seismicity, etc).

We aim at providing new data on coastal archaeological remains collected along the western and southern coast of Malta and to discuss the relative late Holocene tectonic rates.

### 1. STUDY AREA

Malta lies in the Sicily Channel, about 200 km south of the convergent segment of the Europe-Africa plate boundary. The Sicily Channel has been affected, during Neogene-Quaternary (FINETTI, 1984; DART *et al.*, 1993), by continental rifting which produced extensive structures, such as the Pantelleria, Malta and Linosa tectonic depressions, controlled by NW-directed sub-vertical normal faults (Fig. 1). The most active period of extension on both fault trends occurred during the Plio-Quaternary (JONGSMA *et al.* 1985). The Maltese graben system is characterized by

two intersecting fault trends. To the SW of Malta, the 100 km wide NW-SE-trending Pantelleria Rift occur (REUTHER & EISBACHER 1985). It is dissected by the two important ENE-WSW trending graben: the North Gozo and North Malta Graben.

The graben transects Mesozoic to Tertiary shallow marine and pelagic limestones. It has also been responsible for the major tectonic and geomorphological development of the Maltese Islands (ILLIES, 1981).

The stratigraphic succession, characterized by shallow marine deposits, spanning in time from Upper Oligocene to Upper Miocene (VARIOUS AUTHORS, 1993). The studied sites are located on Globigerina Limestone.-

### 2. DATA

We studied two archaeological structures, the first at St. George's Bay, at Birzebbugia and the latter next to Manoel Island, at the Valetta Harbour (Fig. 1).

1) The Birzebbugia archaeological site provides remains of activities related to the coastal zone, during the Bronze Age (ZAMMIT, 1928; ABELA, 1999). It provides two types of archaeological remains. The first type are Bronze Age pits (3500-2900 BP, Fig. 2), located close to the shoreline on

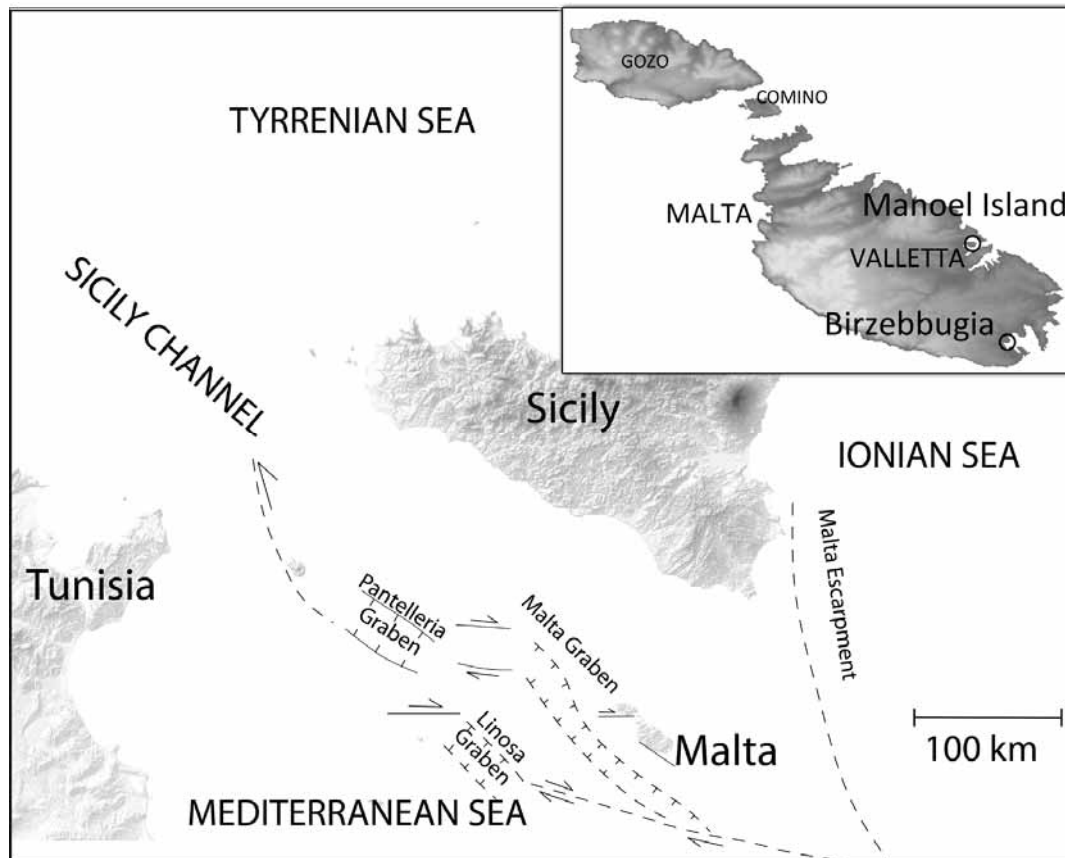


Fig. 1 Geodynamical setting of the Maltese Islands (modified after GALEA, 2007) and location of the two archaeological sites. *Inquadramento geodinamico dell'Arcipelago Maltese (modificato da GALEA, 2007) e ubicazione dei siti archeologici studiati.*

the Globigerina Limestone platform, which are partially submerged. They were dated using pottery discovered in an archaeological site close to the coast. They were probably used as heats, as a red coat has been surveyed at the edge of the structures. The altitude of the lowest pit is -0.9 m and it represents the upper limit of sea level in the studied period, considering that they had to stay surely always above the sea.

The second type are prehistoric cart tracks, completely submerged (ABELA, 1999).

2) At Manoel Island, submerged tanks, maybe Roman in age, with an altitude ranging between -1.20 m at the bottom and -0.7 m at the top of the walls. They could be used to produce *garum* or *purpura*.

### 3. DISCUSSION

On the Island, archeological structures directly carved on rocky outcrops are very common, because of their high rock erodibility. The soft Globigerina Limestones outcrops along the Southern and Eastern sector of the island. Archeological remains have been surveyed just along these coasts. Anyway, observations carried

out along the Maltese coast recorded the presence of a number of nineteenth-century (Victorian-age) swimming pools, usually architecturally well-defined. Their position and their relative bad conservation can easily cause misunderstandings, insomuch as they can be confused with coastal archaeological remains.

Considering the submerged Roman Age tanks, despite their complex attribution, concerning both the age and the function, they seem to suggest that sea level was some tens of centimeters lower than the structure. On the contrary, the altitude of the lowest Bronze Age pit represents the upper limit of sea level in the studied period, considering that they had to stay surely always above the sea. No presence of MIS 5.5 deposits have been surveyed, due (1) to the exposition of the island, that prevents the conservation of rocks and deposits, or (2) to the kind of bedrock easy to dismantle slightly submerged position of the tyrrhenian deposits which deleted them.

Even if, at the moment, few data are available and better interpretations are required, the comparison of surveyed data and LAMBECK & PURCELL (2005) predicted curve, no late-Holocene vertical displacement seem to be occurred.



Fig. 2, The pits at St. George's Bay, Birzebbugia, S Malta.

*Le strutture archeologiche presso St. George's Bay, a Birzebbugia, nella parte meridionale di Malta.*

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