

QUATERNARY MARINE TERRACES IN THE ALBORAN INSULAR SHELF: TECTONICS *VERSUS* SEA LEVEL CHANGES

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Abstract

On the basis of high-resolution seismic profiles and sonographic records supported by bathymetric data we propose a comprehensive description of the marine terraces evolution in the area surrounding the Alboran island, placed in the northeastern corner of the Alboran ridge, in relation to neotectonic activity and sea level changes during the Quaternary.

Keywords: Marine terraces, insular shelf, neotectonics, Alboran bank, Western Mediterranean Sea.

Introduction

The Alboran Sea is situated in the inner part of the western Alpine orogenic belt (Betic-Rifean ranges) between Eurasian and African plates. This region has an important oceanographic dynamic consequence of the Atlantic-Mediterranean water masses interchanges through the Strait of Gibraltar. The Alboran sea floor shows a very complex physiography constituted by sub-basins, structural highs and platforms as a consequence of the close relationship between geomorphology, tectonic, diapirism, volcanism and water deep circulation (1). The most important seamount located in the basin is the Alboran Ridge showing a NE-SW direction. The main feature of this basin is situated in the northeastern sector corresponding to the Alboran Island Bank. The main feature of this bank is the presence of an isolated insular shelf (2) surrounded by the slope domain and disconnected by the nearer continental areas.

Methodology

The data were obtained using a sub-bottom profiler (ORE 3.5 kHz) and echosounder (Furuno FUG 11), from 0 to 500 m depth, and also a side scan sonar (EG&G, 500 kHz) ranging from 0 to 60 m depth. Two oceanographic cruises (Coral 8209 and Alboran 9409 developed by IEO) were performed. From the study of these data we have obtained the detailed description and morphologic mapping of the Alboran Island Bank.

Morphological characteristics of the Alboran insular shelf

The Alboran insular shelf is characterized by an irregular morphology. The maximum extension is 27.75 km and the mean width range between 5 and 6.5 km (Fig. 1). The longitudinal axis of the shelf follows a NE-SW main trend and the emerged area corresponding with the Alboran Island. The breakshelf appear in different depth with average values between 110 and 120 m and followed by a variable slope more abrupt in the southern flank (3). Nine morphological types have been described in the Alboran shelf related with the genesis processes: a) **erosive**: marine terraces, submarine scarps, depressions, channels and edges; b) **sedimentary**: sediment waves and sediment wave fields; c) **tectonic and/or inherent**: morphological highs and stepped shelf. The erosive processes are dominant in the shelf, followed by the tectonic process with are more developed in the southern sector (3). Marine terraces levels are the most relevant morphological type in this shelf and they are the issue of this communication.

Marine terraces

Three marine terraces types have been differentiated in the Alboran shelf related to the eroded material and the presence of associated sedimentary bodies (Fig. 1): a) *marine terraces over hard ground or basement*, b) *marine terraces over sedimentary bottom* and c) *marine terraces with associated sedimentary body*. It has been observed 25 levels of marine terraces without associated sedimentary bodies, among 10 and 95 m in depth (3), presenting the highest frequency between 70-85 m depth and followed by the levels located in the 65-70 m. The marine terraces with associated sedimentary body have been located at 65, 68, 72, 78, 83, y 93 m depth, being more abundant between 85-90 m and 70-75 m.

Comparing the marine terraces steps in southern and northern flanks we point out the existence of steps at 10-15, 20, 24, 26, 28, 30-35, 38, 42, 44, 53, 65, 68, 70, 72, 75, 78, 89 and 95 placed on both flanks, whereas the remaining steps recorded are located in the southern shelf. These results are in agreement with those reported previously in the area flanked by Malaga and Gibraltar (4) and in the Mediterranean area (5), excluding the levels showed in the southern

shelf, which have not been observed before by others authors. The marine terraces in the shelf have been related with short sea level stillstands during the last sea level rising (Flandrian transgression).

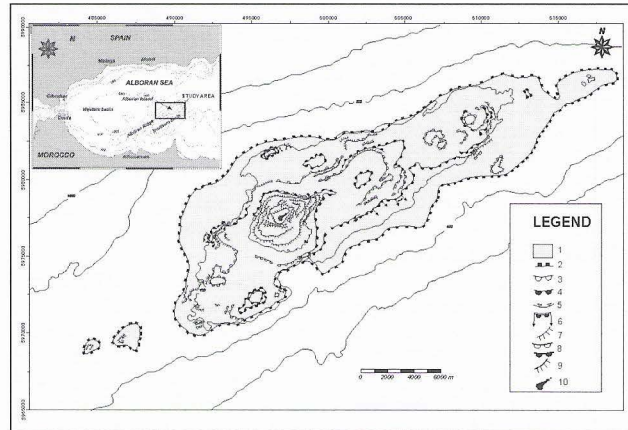


Fig. 1. Marine terraces levels distribution on the Alboran insular shelf. Legend: 1. Continental shelf, 2. Breakshelf, 3. Marine terraces over hard ground or basement, 4. Marine terraces sedimentary bottom, 5. Sedimentary body associated to marine terraces, 6. Tilted marine terraces, 7. Submarine scarps, 8. Marine terraces associated to fault, 9. Fault scarps and, 10. Alboran Island.

On the other hand, this area is characterised by an important seismic and tectonic activity (2), with tilted terraces and terraces associated to fault in the southern flank described in the area. In this way, the sea level change process should be the origin of the terraces steps. In the southern flank should be more likely a higher neotectonic origin than an high level process.

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