

# ON THE TECTONIC ORIGIN OF THE MAIN MORPHOLOGIC FEATURES IN THE ALBORAN SEA BASIN

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## Abstract

A new genetic model is proposed in order to explain the morphology of the Alboran Sea Basin. This model is based in the influence of significant lateral crustal changes, the tectonic evolution, including neotectonics, and the Mediterranean-Atlantic water masses dynamics. The basin is situated in a continental margin context and the main physiographic region is a wide and complex slope. Its morphology is characterized for the presence of several stepped subbasins, and is basically controlled by the development of neotectonic structures of different types and scales: flexures, faults and folds.

*Keywords: Morphology, Structure, Neotectonics, Alboran Basin, Western Mediterranean*

## Introduction

The Alboran Sea is the most western sector of the Mediterranean Sea and is located between the southern Spain and northern Africa coasts. It has been differentiated three main physiographic domains in the Alboran Sea Basin: margins, basins and structural highs (1, 2). This physiographic scheme partially differs from classic divisions in passive continental margins (shelf, slope, continental rise and abyssal plain), that can be considered as its morphologic equivalents.

### Morphologic features

A new interpretative model of morphology is presented in Figure 1. This model considers that the Alboran Sea Basin is situated in a continental margin context with a complex stepped slope marked by the development of several sub-basins at different depths, and the adjacent abyssal plain corresponds to the South Balearin basin (3).

This model shows that the main margin type is the intermediate or stepped. The margin physiography is constituted by shelf and slope, the continental rise is absent and the slope ends to the main sub-basins floor in a progressive or abrupt way. The slope is the main physiographic unit and is marked by its stepped morphology with several structural highs and two important marginal plateau, one in the southern sector (Moulouya plateau) and the other one in the northern sector (Motril-Djibouti plateau).

There are numerous morphological highs with several: tabular, ridge, cone or truncated cone. Basically, they have a structural origin in relation to volcanic buildings or basement elevations, besides it has been described some highs in relation to folded sedimentary cover and diapiric structures (3). The most important high is the Alboran Seamount.

Basins, limited by margins and highs, are tilted eastwards in general (Fig. 1). The main basins are the western and eastern basins because they limits de lower slope. The other sub-basins are situated in an intermediate slope position (3). The Eastern basin show a marked flexure in the transition to the South Balearic basin eastwards (4).

## Morphology origin

The main morphologic features of Alboran Sea Basin are strongly controlled by three factors:

i) Lateral crustal changes. The basin is located mainly on thinned continental crust (5, 6), lateral changes are related to the transition between Betic-Rifean thickened continental crust (northwestwards and southwestwards) and the South Balearic oceanic crust eastwards. The basin shows a general elevation in comparison to marine basins with an oceanic crustal substratum.

ii) Tectonic context. The basin has been generated in the back area of the Betic-Rifean arcuated orogen and is situated in its inner part. The last stage in the orogenic evolution has resulted from the collision of a platelet against the older Northafrican and Southiberian continental margins during late Oligocene and Miocene.

The Alboran sea basin has been generated in this stage since the Lower Miocene and has suffered a complex tectonic evolution (5), including a new basin configuration from the Upper Tortonian (2, 7), as well as to development of neotectonic structures (3).

iii) Mediterranean-Atlantic dynamics. The Alboran Sea region is submitted to gateways dynamics and water masses communication between the Mediterranean Sea and the Atlantic ocean since Lower Pliocene at least. In this sense, this factor has generated a strong marine dynamics constrained by basin physiography as well as has produced a strong influence on the development of erosive and sedimentary processes in the basin.

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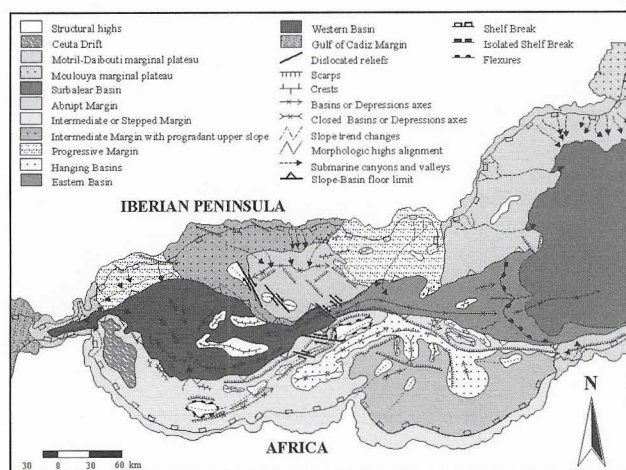


Fig. 1. Cartography of main morphologic domains distribution of the Alboran Sea Basin. Redrawn from Vázquez (3).