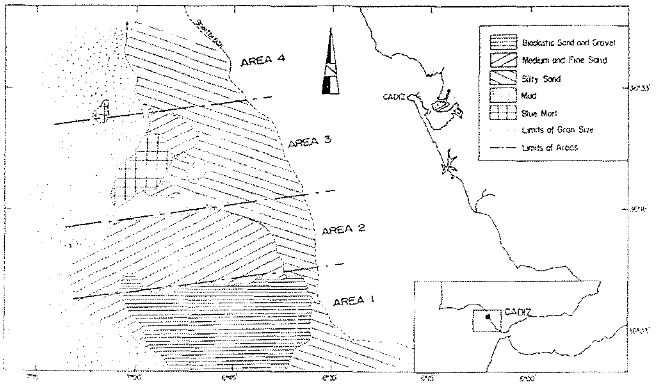
BOTTOM SEDIMENT DISTRIBUTION IN THE GULF OF CADIZ SLOPE INFLUENCED BY THE MEDITERRANEAN UNDERCURRENT

RODERO J.[1] and MALDONADO[1,2] A.

[1] Instituto Andaluz de Geología Mediterránea, CSIC. C/Fuentenueva s/n 18002.
[2] Depart. de Geodinámica, Universidad de Granada. C/Fuentenueva s/n 18002. Granada, Spain

As a result of the opening of the strait of Gibraltar at the end of the Miocene, the connections between the desiccated Mediterranean sea and the Atlantic ocean were stablished with circulation patterns probably similar to the present (MALDONADO, 1992). The interaction between different water masses resulted in a complex current system in the Gulf of Cádiz continental margin, which influenced sediment distribution and depositional patterns (NELSON *et al.*, 1992). One of the main controlling factors of the sediment distribution in the Gulf of Cádiz is the interplay of several water masses at different depths in response to the circulation patterns of the flows from the Mediterranean and the Atlantic water masses (HEEZEN and JOHNSON, 1979). The flow from the Mediterranean is known as the Mediterranean undercurrent, which is characterised by high salinity, resulting in a more dense water mass than the colder Atlantic waters. As it leaves the strait of Gibraltar, the Mediterranean undercurrent flows between 200 and 1800 m water in a WNW to NW direction along the continental margin of the Gulf of Cadiz, influencing particularly sediment distribution along the shelf brake and upper slope. The predominant Atlantic water flow, in contrast, follows the continental shelf in a ESE to SE direction to enter the Mediterranean sea through the strait of Gibraltar.



The Mediterranean undercurrent decreases in speed as it moves NW, away from the strait of Gibraltar. The speed ranges between maximum velocities of 250 cm/s (KENYON and BELDERSON, 1973) to 181 cm/s (AMBAR and HOWE, 1979) near the strait, to 10-20 cm/s in the central sector of the Gulf of Cadiz. This decrease in energy results in a distinct gradation of sediment types in the margin. Four main areas have been identified in the continental margin on the basis of the grain-size distribution :

Area 1. This area occupies the southernmost sector of the Gulf of Cadiz. It is characterised by bioclastic sand and gravel, developed as a lag deposit due to the erosion and transport of the finer, terrigenous fraction by the strong Mediterranean undercurrent. There are also locally outcrops of the basement, without sediment cover due to the strong bottom current. These sediments deposits develop several types of bedforms (NELSON *et al.*, 1992).

Area 2. This area extends to the north of Area 1, near the central sector of the Gulf of Cadiz. The predominant grain size is medium to fine sand, although there is also a significant proportion of bioclastics components of finer grain-size than in Area 1. The bedforms are characterized by mass-gravity flows, probably influenced by both, the Mediterranean undercurrent and down-slope flows.

Area 3. This area occupies the central sector of the Gulf of Cadiz. The bottom morphology is very complex and it is characterized by topographic ridges and canyons, oriented perpendicularly to the margin and subhorizontal platforms at several depths in the slope. The distribution of sediment types, in consequence, is controlled by the location of the topographic irregularities in respect to the Mediterranean undercurrent and the location of submarine canyons. In the areas exposed to the Mediterranean undercurrent the predominant grain-size is fine sand, while in protected areas dominates silty sand and finer materials..

Area 4. The Area 4 occupies the northern sector of the study region. It is characterised by clavely silts and silty clays, reflecting the significant decrease in energy of the Mediterranean undercurrent. The deposits develop locally contour bodies in the vicinities of the topographic irregularities

The northwestward variation in grain-size is also reflected by a host of bedforms which also record the decrease of energy of the Mediterranean undercurrent (NELSON *et al.*, 1993). Thus, sand dunes occur in the southernmost area, large mud waves are found to the West as the grain size diminishes, and large contoured bodies are observed in the northernmost regions.

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FROM THE TYRRHENIAN TO THE IONIAN DOMAIN : DIFFERENT MODE OF BASIN FORMATION

Marco ROMANELLI[1], Carmelo MONACO[2], Rinaldo NICOLICH[1] and Luigi TORTORICI[2]

[1] DINMA, Università di Trieste, Italy
[2] Istituto di Geologia e Geofisica, Università di Catania, Italy

One of the peculiar features of the central Mediterranean is represented by the occurrence of stretched areas developing at the rear of mountain belts. The Tyrrhenian sea, the most recent of these basins, has been developing since the Tortonian time up to the present. The geodynamic significance of the Tyrrhenian domain and its relations with the Calabrian arc and, consequently, with the Ionian domain are still debatable. The Tyrrhenian domain is, in fact, interpreted as a back-arc basin related to the subduction of the Ionian domain underneath the Calabrian arc or as a stretched area as a result of the astenosphere domal uplift. Finally, it is interpreted as an asymmetric passive rifting developed as a consequence of the N-S collision between the African and European plates.

In order to test these different hypotheses, the structural setting of sedimentary basins which occurr along a transect extending from the southern Tyrrhenian sea (Marsili basin) to the Ionian domain (external front of the Calabrian arc) has been analyzed. This study, supported by the analyses of several reflection and refraction seismic profiles and by stratigraphic, sedimentological and structural data carried out on the onshore Neogene-Quaternary basins of the Calabrian arc, points out a complex interplay between extensional and compressional processes that governs the geodynamic evolution of this region.

Along the studied transect three main types of sedimentary basins have been recognized. The first is related to rifting processes and develops above a thinned continental and/or oceanic crust. On the contrary, the second type is related to underplating processes developing above accretionary wedge domains or on the frontal portion of the crustal backstop. Finally, the third type of sedimentary basin is related to accomodation processes occurring at the rear of the accretionary wedge in ored to maintain its stable geometry in response to the underplating. These different basins, developed in space and time, are superimposed on each other suggesting an overall southeast migration of the geodynamic processes which govern the whole system.

In addition, a carefully analysis of these data together with geophysical and structural information on the active tectonics characterizing this region allow us to infer that the process responsible for the opening of the southern Tyrrhenian sea and therefore for the development of the sedimentary basins is at present inactive.