LONG-TERM DEVELOPMENT AND CURRENT STATUS OF THE BARCELONA CONTINENTAL SHELF

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Abstract

The seafloor and subseafloor of the Barcelona continental shelf (NW Mediterranean Sea) records its Late Quaternary history and the imprint of the factors controlling this sediment-dispersal system. Two main morphosedimentary domains have been recognized: (i) a relict, sediment depleted area, and (ii) a modern, river-influenced area. Both domains are affected by a variety of anthropogenic impacts such as the enlargement works of the Port of Barcelona, sewage pipes, dredging, anchoring and trawling. *Keywords : Continental Shelf, Geomorphology, Sea Level, Swath Mapping, Western Mediterranean.*

The Barcelona continental shelf, off the city of Barcelona (NE Spain), is a relatively narrow canyon-bounded shelf in the northwestern Mediterranean Sea [1]. Two medium-size rivers (Besos and Llobregat) and several ephemeral rivulets flow into this margin. A detailed geomorphologic study based on multibeam bathymetry and backscatter data, high resolution seismic profiles, and surface sediment samples allowed mapping and interpreting the main distinctive seafloor features on the Barcelona shelf. Two main domains have been identified in the Barcelona shelf: (i) a relict area mostly lacking recent sedimentary coverage, and (ii) a modern area influenced by recent rivers discharge (Fig. 1). Both areas show the imprint of various human impacts.

A large part of the study area is sediment-depleted where relict (Late Pleistocene-Holocene) morphosedimentary features such as beach ridges and beachrocks crop out (Fig. 1). These paleo-coastal indicators form two different sets that follow N090 and N030 orientations. Their morphosedimentary arrangement is interpreted as a 45° shift of the seashore direction between MIS 4 and MIS 2. Multibeam and seismic reflection data allowed mapping a complete set of NE-SW seafloor normal faults in the Barcelona sediment-depleted area (Fig. 1). The faults resulted from reactivation of the deep Neogene extensional structures of the margin [2].



Fig. 1. A) Swath bathymetry shaded relief map of the Barcelona continental shelf and onland orthophotomap. White lines correspond to river courses. Numbers mark some examples of the interpreted seafloor features. 1: Faults. 2: Beachrocks. 3: Relict coastal sand bodies. 4: Large submarine step. 5: Finest sediments depositional areas. 6: Wavy prodelta front. B) Stretch showing the general zonation of the Barcelona shelf. a: Severely anthropogenically impacted area. b: Modern, river-influenced shelf domain. C: Relict, sediment depleted shelf domain. Map projection is UTM 31N WGS84.

Modern sedimentary features reveal that the Llobregat River is the main sediment source of the Barcelona prodeltaic shelf. The Llobregat and Besos adjacent prodeltas are the main Holocene depocenters in the study area. However, the continental shelf reaches its minimum width off the Llobregat River mouth as most of the sediment inputs are deviated southward by the dominant coastal circulation. The wavy nature of the Llobregat prodelta front (Fig. 1) may result either from hyperpycnal and bottom currents or from soft sediment destabilization [3].

Anthropogenic impacts are widespread on the Barcelona inner and middle shelf, especially along the Besos-Llobregat coastal stretch (Fig. 1). Coastal infrastructures already have a major impact on sediment dispersal patterns, that will likely increase in the near future. The Port of Barcelona directly affects a large part of the Llobregat prodelta and has the potential to disrupt the natural paths of sediment transport. The seafloor sediment cover is largely reworked by dredging, anchoring, and trawling activities. Fluvial water and solid discharge are equally affected by the anthropogenic pressure.

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