RECENT EVOLUTION OF GULLIES AND CHANNELS IN THE NE ALBORAN SLOPE

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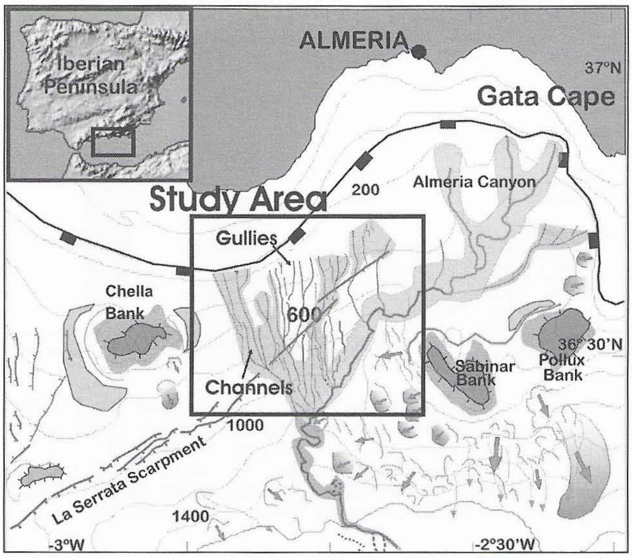
Abstract

A complex system of valleys covers more than 300 km^2 at the Almeria Canyon western margin (300-1250 m deep). At least sixteen leveed channels and six gullies form a dendritic pattern convergent to the canyon. High-resolution seismic profiles show the alternance of seismic facies related to high- and low-energy sedimentary regimes, indicating a cyclic pattern in the recent evolution. Valleys develop during high-energy regimes, when the downslope gravity-flows produce overbank deposits in channel levees and erosion in gullies. Structural features, sea-level changes and variations in the slope gradient seem to have conditioned the spatial and temporal changes in valleys characteristics.

Keywords: Alboran Sea; Gullies; Channels; Turbidite Systems.

The Almeria Margin (NE Alboran Sea) is a complex geologic area where the morphology is controlled by tectonism, volcanism and depositional-erosive processes (Fig. 1). The main morphosedimentary feature in this area is the Almeria Turbidite System, formed by the Almeria Canyon and Channel, overbank deposits and lobe deposits (1). High resolution seismic profiles (TOPAS) and multi-beam bathymetric information off the NE Alboran Sea (Almeria Margin) obtained during the HITS cruise (2) reveal the existence of a complex pattern of valleys that cover more than 300 km^2 at the west margin of the Almeria Canyon (water depths between 300 and 1250 m).



The studied valleys can be grouped in two types -channels and gullies- according to their size, morphology and seismic imprint. Sixteen **channels** have been identified. They are leveed channels with channel infilling and typical U-shaped cross-sections. Channels have lengths of 2.5-22 km, widths of 0.3-1 km and relieves smaller than 15 m. In contrast, the six **gullies** lack present-day depositional features and are shorter and deeper than channels, with lengths minor than 12 km, and relief up to 40 m. Their widths range between 0.5 and 1 km, and the cross-sections are V-shaped. Channels and gullies have general N-S to NNW-SSE directions, perpendicular to the regional slope gradient. They have low sinuosity, except in the areas affected by La Serrata Fault (NE-SW direction) where axes display sharp changes in direction and gradient.

Channels and gullies spatial distribution is complex. Channels display a convergent hierarchical pattern, where shorter channels merge with larger ones that flow into the Almeria Canyon at depths between 1100 and 1250 m. Three gullies locate in the middle of the area occupied by channels and form part of the same hierarchical pattern, as they converge into one of the main channels at 600 m deep. Another three gullies locate at the eastern area, and flow directly into the canyon, at 765, 910 and 960 m deep. Valleys also present downslope variations in their characteristics. Three valleys can be classified as channels along their itinerary, except in an area located at the SE side of La Serrata Fault, between 650 and 950 m deep, where they display the morphologic and seismic characteristics of gullies.

The seismic stratigraphy of the area where channels and gullies develop comprises at least four seismic units defined by distinct seismic facies. The lateral continuity of the facies is interrupted by the incision of gullies and channel-fill and overbank deposits. These facies are, from older to younger: (1) parallel stratified unit formed by reflections of medium to high reflectivity in gullies and inter-valleys areas that laterally becomes chaotic near the channels; (2) A transparent facies unit that displays a layered sheet geometry; (3) High reflectivity facies unit, parallel-stratified in intervalley areas and chaotic near channels; and (4) Transparent to semi-transparent facies draping the whole area, including gullies and leveed channels.

The recent evolution of the system can be inferred from the sedimentary record. Seismic units 1 and 3, with high-acoustic amplitude and development of levees in the margins of the channels would be related to high-energy regimes, when the gravity-flows produce overbank deposits. In contrast, homogeneous seismic units 2 and 4 may be deposited by a low-energy sedimentary regime, when pelagic or hemi-pelagic deposition dominates the whole area. The alternance of high and low-energy periods indicates a cyclic pattern of valleys growth.

Channels and gullies characteristics and spatial distribution should be related to changes in the local sediment transport from gravity flows. The properties of the gravity flows vary downslope, across-slope and with time, conditioning the presence or absence of the overbank flows, and so the development of channels or gullies respectively. Structural features, sealevel changes and variations in the regional slope gradient seem to have conditioned the downslope changes of channels and gullies characteristics. The presence of a thin semitransparent layer over the whole system suggests that channels and gullies may have been inactive during recent times.

References

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This work was supported by the project REN2001-3868-C03-03 (MARSIBAL)