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Morphology of Submarine Canyons in the Palomares Margin (East of Alboran Sea, western Mediterranean)

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Morphological analysis on the Palomares Margin has been done using high-resolution swath bathymetry data collected during the MARSIBAL-06 (2006) cruise on board of the R/V BIO Hespérides. Complemented with data from GEBCO 2000 and Ifremer (Medimap Group, 2007) the data-set provides the first complete bathymetric mosaic of the Palomares Margin. The bathymetric mosaic allows to study the physiographic provinces of the Palomares Margin and to conduct, for the first time, a detailed morphological analysis of the two main sediment-transfer conduits: the Gata and the Alias-Almanzora Canyons.

The Gata Canyon extends for 64km from the outer shelf to the base of the slope with a general W-E direction. A tributary system of canyons originates at the shelf break and continues on the slope until they merge at 1230m water depth. The walls of the canyons are characterized by repeated slides. Perpendicular profiles to the Canyon pathway reveal gentle transversal “V” asymmetrical shapes with a marked axial incision on the canyon floor (highs between 65 to 103m in the southern flank, and between 30-90m in the northern flank). The transition from an erosional canyon to a deposition channel is located at 2100m water depth, and is characterized by trapezoidal shapes on transversal profiles accompanied of lower relieves (40-65m). At the mouth of the canyon-channel system no sedimentary lobes are observed.

The Alias-Almanzora canyon (73km long and preferential direction W-E) is located North of the Gata Canyon and extends from the continental shelf to the base of the slope. A tributary system to the Alias- Almanzora canyon-head locates less than 150m from the coast, facing a fluvial drainage system onland. Proximal tributary canyons and gullies feed the main canyon until it merges in the continental slope at 1516m water depth. The tributary system exhibits a marked “V” shape in transverse profiles and marked axial incisions. Down slope, transversal profiles have trapezoidal shapes. Longitudinal profiles show convex-up sections along the tributary system and concave-up sections from the merge in the main canyon down slope. The transition from an erosional canyon to a depositional channel is located at 2100m water depth. The mouth of the Alias-Almanzora Canyon-channel system is characterized by distributaries channels and lobated features.

Morphological analyses from these Canyons indicate they have different origin and evolution. The connection of the Alias-Almanzora Canyon to a fluvial drainage system offshore suggests the canyon formed by erosion of the continental shelf edge during sea-level low stand periods, when entrapment of sediment on deltas and reduced sediment transport through submarine canyons occurred. The Gata Canyon has instead developed by head wards erosion and gravitational instabilities. Both canyon systems are highly influenced by recent tectonics, and structural trends influence their location and changes in pathways.

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