Recent sedimentary processes in the Cap de Creus canyon head and adjacent continental shelf, NE Spain: evidence from Multibeam Bathymetry, Sub-bottom Profiles and Coring

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Abstract

High-resolution seafloor bathymetry and shallow sub-bottom profile data reveal a range of geomorphic expressions in the Cap de Creus canyon head and its adjacent continental shelf, which can be tied to processes of deposition and erosion. A complete suite of geophysical and acoustic data and large set of cores (piston, kasten and box cores) were acquired during different surveys between 2004 and 2005. The acoustic and seismic data provide a detailed image of the present seafloor and subsurface. We have identified and correlated a total of 13 acoustic facies, tying these to seafloor samples obtained by coring. The integration of the seafloor, shallow subsurface, and core data assist in defining the processes responsible for each of the acoustic facies. The analysis of headspace gas in the core samples indicates a few local sources of anomalous methane. Morphologically, the north and south walls of the canyon are very different. The north wall of the canyon is incised by numerous large amphitheatre shaped slump scars draped by recent sediment accumulation, and it shows relatively low backscatter. Outcrops, positive relief features, are relatively rare and isolated. The south wall is characterized mostly by erosive processes and relatively high backscatter. Our interpretation shows a present erosive and active canyon with a wide range of processes shaping the present-day seafloor. The depositional processes are mostly located in the shallow area with a sandier seabed on the continental shelf and siltier sediment near the head of the canyon. We have interpreted a field of wavy seafloor and a 20 m thick progradational bedform on the continental shelf. Inside the head of the canyon, chaotic facies, furrows, sharp and hyperbolic echoes cover the seafloor indicating how widespread the erosive processes are in the region. The controlling factors for the depositional and erosional environments of the area are discussed and linked with the geophysical datasets.