



Submarine canyons of the north-western Sicilian offshore (Southern Tyrrhenian Sea): variability in morphologies, sedimentary processes and tectonic settings

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Swath-bathymetry and high-resolution seismic reflection records acquired during the last two decades in the north-western Sicilian offshore has unveiled a dense network of submarine canyons within the depth range of 80-2100 m, displaying a relevant variability in their geometry, morphologies and sedimentary processes. The studied margin shows a young, tectonically active shelf to slope setting linking the Sicilian-Maghrebian Thrust Belt to the Tyrrhenian oceanic realm, developed during the Neogene-Quaternary time span. The aim of this study is to highlight the main governing factors that contributed to the evolution and differentiation of the northern Sicilian canyons, mainly focusing on the Gulf of Castellamare and on the Gulf of Palermo areas. Canyons range 10-62 km in length and 1-5 km in amplitude, the slope gradient along their axis ranges between 1.8° and 9° and their sinuosity index ranges between 1 and 1.7. Generally, canyons, tributaries and gullies mapped in the Gulf of Castellamare indent the shelf-edge and display sinuous to meandriform paths on a upward concave gently sloping margin, showing a relevant role of coastal/shelf sedimentary inputs in their evolution. Otherwise, canyons along the upward convex slope in the Palermo Gulf are steep and almost linear, with retrograding submarine landslides controlling their evolution and only one canyon (the Oreto Canyon) showing a proved connection with fluvial sedimentary inputs. Results suggest that the different structural settings of the Castellammare and Palermo basins, together with an inferred difference in fluvial sedimentary inputs, are responsible for the variability of the north-western Sicilian submarine canyon systems, which originated and evolved contemporary with the upper Pliocene(?) - Quaternary sedimentary succession and have probably been more active during the Quaternary glacial maxima. On a local scale, neo-tectonic features, mass-movements and fluid seeps processes are significant controlling factors on the distribution of the canyons. The present day morphology of the margin shows that the most incised canyons are those facing the prominent capes along the coast, suggesting how the interaction of bottom currents with the shelf geometry likely has controlled their recent evolution.