

Submarine morphology off Southeastern Calabria, Italy (Ionian Sea)

by

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Abstract

Rapid erosion delivers huge masses of sediment from the uplifted Calabrian Massiv into the Ionian Sea. The submarine morphology of the Calabrian shelf — especially on the Ionian side — is remarkably different from the shelves of stable areas, e.g. Apulia : Smale and broad areas change abruptly, submarine canyons often reach the coasts.

The area investigated has the above three elements of submarine morphology. The question was : What are the factors controlling shelf morphology in an area of great sediment discharge?

Between C. Bruzzano and Siderno (25 km) the seafloor was surveyed up to 12 km off the coast by 480 km echosounding profiles. With this information a bathymetric chart was made from which we can deduce several different processes and stages of the general destruction of the pleistocene shelf :

1. The backward erosion of the Buonamico-Careri-Canyon due to pebble and sand supply from the rivers and the longshore transport.

2. The breaking-off of large sediment masses (0.1 - 1 km³) near the shelf break. The failure is caused by overloading of rapidly accumulated fine grained sediments.

3. Gentle erosion of the shelf break and the slope below by means of suspension currents deriving from waterdepths where they cannot settle because of wave action. The erosion efficiency of these suspensions increases with water depth by acceleration on the slope. As a result of this process submarine valleys on the slope develop a tributary pattern at the shelf break (4,5 km off the coast) and show no marks of sediment flow and no morphological correspondence to a river. This is in contrast to the Buonamico-Careri-Canyon.

The motor of these different processes of shelf destruction is the excessive delivery of erosion material from the Calabrian Massiv.

The comparison of the soundings of 1876-77 (Italian seachart Nr. 23) with recent echosoundings shows remarkable changes of waterdepth as a result of sedimentation (up to 40 meters on the outer shelf) and erosion (up to 80 meters in the upper part of the Canyon and below the shelf break). The coast line moved up to 350 meters seaward at river mouths without corresponding canyons and moved more than 100 m backward at the Buonamico-Careri-Canyon's head.

We do not regard the degree of these divergences as a natural for 100 years but as an effect of the damming up of the rivers in the early 20th century. This damming up has changed the river regimen and accelerated the natural dynamic processes of sediment transport and shelf destruction.

In recent times we observe the rapid change of shelf morphology; a transition from the pleistocene past towards a recent dynamic equilibrium between acting forces, sediment discharge, and submarine morphology.

The greater the sediment discharge at the coasts the more the destruction of the pleistocene shelf has succeeded as we can see on the character of the line of reciprocal DR.

