

Right-angle pattern of minor fluvial networks from the Ionian terraced belt, southern Italy: passive structural control or foreland bending?

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Morphometric analyses of both the topography and drainage network are valuable tools to investigate the influence of Quaternary tectonics and eustatic cycles on coastal landscape evolution. A detailed analysis of the drainage network morphometry, combined with the study of the topographic attributes, was performed in a large (i.e. about 400 sq. km) part of the Ionian coastal belt of southern Italy. The study area represents the southernmost sector of the Bradano Foredeep and is bounded by the front of the south-Apennine chain and the edge of the Apulian Foreland. Since Middle Pleistocene, a continuous tectonic uplift occurred. In response to the interplay between such a tectonic uplift and eustatic variations of the sea level, several orders of marine terraces developed, ranging in age from about 600 ka to about 60 ka. In fact, the study area landscape is featured by a staircase of polygenic terraces (originally generated as marine terraced surfaces) gently-dipping toward the Ionian sea (slope angles ranging from 3° to 5°), repeatedly interrupted by morphological scarps. A trellis-type fluvial network deeply cut the flight of marine terraces, draining into three main rivers (Bradano, Basento, and Cavone rivers) characterized by meandering-type channels and large alluvial plains.

We calculated statistical properties of landscape and estimated some geomorphic indices that reflect the interaction between erosional and tectonic processes. Studies on topographic attributes, morphometric indices, and analysis of longitudinal river profiles were integrated with classical (i.e. field survey and photo-aerial interpretation) morphostructural analysis, focused on both the relict and active landforms. Morphotectonic investigations allow us to provide new constraints on the Late Quaternary geomorphological evolution of this sector of southern Italy.

The right-angle pattern of minor fluvial net which cuts the terraced surfaces is largely diffused and regularly spaced in the whole study area, suggesting a control by a pervasive orthogonal fracture system rather than by isolated faults and/or master joints. Such a structural pattern and the arrangement of the terraces slope don't match very well with the tectonic features associated to a vertical uplift motion. Fractures were produced and preserved into the brittle caprock of the terraces, made by conglomerate, and exerted their control on the minor fluvial channels that progressively deepened into the underlying Pleistocene clay and sand, but they are not much represented in these soft rocks. Since a similar pervasive and orthogonal fracture pattern is actually generated by gentle folding of rocks, the development of the Ionian hydrographic networks could be attributed to a general - maybe still active - bending of the foredeep area due to the eastward propagation of blind thrusting of the Apennines chain.