3D Architecture and Plio-Quaternary evolution of the Paola Basin: New insights to the Forearc of the Tyrrhenian-Ionian Subduction System

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The 3D stratigraphic architecture and the Pliocene to Quaternary evolution of the Paola Basin (offshore western Calabria), a segment in the fore-arc of the Tyrrhenian-Ionian subduction system, are reconstructed by using a grid of unpublished of multi-channels, high-penetration, seismic-reflection profiles acquired in the frame of the project SINBUS, integrated by bathymetric data from EMODnet-Bathymetry portal. The Paola Basin is a NNW-SSE elongated, ~ 60 km long and ~20 km wide, slightly asymmetric syncline, which hosted Plio-Quaternary deposits up to 5.5 km thick in its depocenter. The Plio-Quaternary sequence shows an eastward progradational internal geometry that becomes sub-horizontal in the uppermost part. The geometries of deposits suggest that the source area for sediments had to be localized, at first, in the West or North-western sector of the basin, and in the Coastal Chain during the late stage of the basin evolution. Post-Messinian tectonic shortening of reflectors is less than 5% in both the directions of the principal axes of the basin, and thus it is negligible. Tectonic features associated with strike-slip restraining and releasing bends are interpreted along the western sector of the basin. They form a NS-trending and geomorphically prominent ridge separating the Paola Basin from the central sector of the Calabrian margin. The area of the future Paola Basin and its eastern prolongation until the western flank of the Sila Massif was affected by subsidence during and after the Messinian time. At ~ 3.5 Ma, subsidence persisted in the Paola Basin segment, while the area corresponding to the Coastal Chain and the Sila Massif uplifted. As a consequence, a regional scale asymmetrical syncline (Paola Basin) and anticline (Coastal Chain and the Sila Massif) developed. Also, normal faults formed in the hinge zone of the anticline and the Crati Basin nucleated. Based on the wave-length and position of the maximum amount of vertical movements experienced by the fore arc segments affected by subsidence and uplift as well as the lack of significant faults bordering the Paola Basin, the formation of these features could be related at the flexure of the upper plate in response to the subduction system dynamics and sediment load. The strain partitioning into strike-slip fault zones occurred in response to the oblique subduction of the Adriatic-Ionian plate. On the basis of the strike-slip fault zones recognized to the west of the Paola Basin and documented by several authors along the northern Calabrian Arc as well as the lack of significant internal deformation within the sedimentary infill of the Paola basin, the fore arc basin of the Tyrrhenian-Ionian subduction system can be classified as a neutral accretionary-type forearc basin.