3D Architecture and Plio-Quaternary evolution of the Paola Basin: Insights into the Forearc of the Tyrrhenian-Ionian Subduction System

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Fore-arc basins form structurally in response to a variety of subduction zone processes. The sedimentary infill records the tectono-stratigraphic evolution of the basin, and thus, provides information on the dynamic of the fore-arc region. Using seismic reflection profiles and bathymetric data, we analysed the stratigraphy and tectonics of the Paola Basin, deciphering the tectono-sedimentary mechanisms that acted in the forearc of the Tyrrhenian-Ionian subduction system during the Plio-Quaternary. The Paola Basin is a NNW-SSE trending syncline, bounded by the Coastal Chain to the east and a regional-scale anticline, here called Paola Anticline, to the west. There are no major normal faults bordering the basin. It hosts up to 5.2 km thick Plio-Quaternary deposits, most of them supplied from Apenninic/Sila entry points and transported by longshore currents. The total subsidence reaches the value of ∼5 km. The sedimentary load varies from 60% to 75% of the total subsidence. The Pliocene to Lower Pleistocene sedimentary infill of the syncline displays a strata growth geometry consistent with a continuous rotation of the eastern limb of the Paola Anticline. Crustal folding is the mechanism that better explains the lack of significant normal faults bordering the Paola Basin, its tectonic subsidence and the uplift of the Paola Anticline. During the Late Pliocene - Early Pleistocene, contractional deformation continued, and also strike-slip movements affected both the Paola Anticline and the eastern sector of the basin. This resulted in the growth of the central sector of the Coastal Chain, leading to the definition of the Paola and Crati basins, previously connected in a larger proto basin. Also, strike-slip faults with associated releasing and restraining bends formed in the hinge zone of the Paola Anticline. The bathymetric expression of the strike-slip zone consists of structural highs and depressions that overall form the Paola Ridge. The development of strike-slip tectonics is associated to the trench-parallel component of the upper plate motion occurring in the oblique subduction setting. The growth of the Paola Anticline and Paola Basin was coeval with the opening of the Vavilov and Marsili back arc basins. Thus, extensional and contractional tectonics spatially coexisted along sectors of the upper
plate of the Tyrrhenian-Ionian subduction system from Early Pliocene to Early Pleistocene. Since the Middle Pleistocene, the growth of the Paola Anticline and Paola Basin came to an end, and extensional tectonics controlled the evolution of the forearc region.