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Geodynamic Evolution of the Tunisian Dorsal Backland (Central Mediterranean) from the Cenozoic to Present

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Abstract : The study region is located in the Tunisian Dorsal Backland (Central Mediterranean), which is the easternmost part of the Saharan Atlas mountain range, trending southwest-northeast. Based on our fieldwork, seismic tomography images, seismicity, and previous studies, we propose an interpretation of the relationship between the surface deformation and fault kinematics in the study area and the internal dynamic processes acting in the Central Mediterranean from the Cenozoic to the present. The subduction and dynamics of internal forces beneath the complicated Maghrebides mobile belt have an impact on the Tertiary and Quaternary tectonic regimes in the Pelagian and Atlassic foreland that is part of our study region. The left lateral reactivation of the major "Tunisian N-S Axis fault" and the development of a compressional relay between the Hammamet Korbous and Messella-Ressas faults are possibly a result of tectonic stresses due to the slab roll-back following the Africa/Eurasia convergence. After the slab segmentation and its eastward migration (5–4 Ma) and the formation of the Strait of Sicily "rift zone" further east, a transtensional tectonic regime has been installed in this area. According to seismic tomography images, the STEP fault of the "North-South Axis" at Hammamet-Korbous coincides with the western edge of the "Slab windows" of the Sicilian Channel and the eastern boundary of the positive anomalies attributed to the residual Slab of Tunisia. On the other hand, significant E-W Plio-Quaternary tectonic activity may be observed along the eastern portion of this STEP fault system in the Grombalia zone as a result of recent vertical lithospheric motion in response to the lateral slab migration eastward to Sicily Channel. According to SKS fast splitting directions, the upper mantle flow pattern beneath Tunisian Dorsal is parallel to the NE-SW to E-W orientation of the Shmin identified in the study area, similar to the Plio-Quaternary extensional orientation in the Central Mediterranean. Additionally, the removal of the lithosphere and the subsequent uplift of the sub-lithospheric mantle beneath the topographic highs of the Dorsal and its surroundings may be the cause of the dominant extensional to transtensional Quaternary regime. The occurrence of strike-slip and extensional seismic events in the Pelagian block reveals that the regional transtensional tectonic regime persists today. Finally, we believe that the geodynamic history of the study area since the Cenozoic is primarily influenced by the preexisting weak zones, the African slab detachment, and the upper mantle flow pattern in the central Mediterranean.

Keywords : Tunisia, lithospheric discontinuity (STEP fault), geodynamic evolution, Tunisian dorsal backland, strike-slip fault, seismic tomography, seismicity, central Mediterranean
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