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Seismotectonic Deformations along Strike-Slip Fault Systems of the Maghreb Region, Western Mediterranean

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Abstract : The northern Maghreb region (Western Mediterranean) is a key area to study the seismotectonic deformations across the Africa-Eurasia convergent plate boundary. On the basis of young geologic fault slip data and stress inversion of focal mechanisms, we defined a first-order transpression-compatible stress field and a second-order spatial variation of tectonic regime across the Maghreb region, with a relatively stable SHmax orientation from east to west. Therefore, the present-day active contraction of the western Africa-Eurasia plate boundary is accommodated by (1) E-W strike-slip faulting with a reverse component along the Eastern Tell and Saharan-Tunisian Atlas, (2) a predominantly NE trending thrust faulting with strike-slip component in the Western Tell part, and (3) a conjugate strike-slip faulting regime with a normal component in the Alboran/Rif domain. This spatial variation of the active stress field and the tectonic regime is relatively in agreement with the inferred stress information from neotectonic features. According to newly suggested structural models, we highlight the role of main geometrically complex shear zones in the present-day stress pattern of the Maghreb region. Then, different geometries of these major preexisting strike-slip faults and related fractures (V-shaped conjugate fractures, horsetail splays faults, and Riedel fractures) impose their component on the second- and third-order stress regimes. Smoothed present-day and Neotectonic stress maps (mean SHmax orientation) reveal that plate boundary forces acting on the Africa-Eurasia collisional plates control the long wavelength of the stress field pattern in the Maghreb. The seismotectonic deformations and the upper crustal stress field in the study area are governed by the interplay of the oblique plate convergence (i.e., Africa-Eurasia), lithosphere-mantle interaction, and preexisting tectonic weakness zones.

Keywords : Maghreb, strike-slip fault, seismotectonic, focal mechanism, inversion
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