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Regional patterns of earthquake sources in western Greece: Insights on the 3-D stress tensor and seismic velocity structure arrangement

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We analyzed a large number of focal mechanisms and relocated earthquake hypocenters to investigate the geodynamics of western Greece, the most seismically active part of the Aegean plate-boundary zone. This region was seismically activated multiple times during the last decade, providing a large amount of enhanced quality new information that was obtained by the Hellenic Unified Seismological Network (HUSN). Relocated seismicity appears concentrated above 25 km depth, exhibiting spatial continuity along the convergence boundary and being clustered elsewhere. Earthquakes are confined within the accreted sediments escarpment of the down-going African plate against the un-deformed Pindos hinterland. The data arrangement shows that Pindos constitutes a seismic boundary along which large stress heterogeneities occur. Surprisingly, in Cephalonia no seismicity related with the offshore Cephalonia Transform Fault (CTF) is observed. Onshore, N-S crustal extension dominates, while in central and south Peloponnesus the stress field appears rotated by 90˚. Shearing-stress obliquity by 30˚ is indicated along the major strike-slip faults, consistent with clockwise crustal rotation. Within the lower crust, the stress field appears constrained by plate kinematics and the distributed deformation, which guide the geodynamics of the area.

Seismic velocity anomalies have been resolved by regional body-wave traveltime tomography applying an iterative tomographic inversion scheme using phase data from more than 5,000 seismic events recorded by the Hellenic Unified Seismological Network (HUSN), analyzed by the Seismological Laboratory of the University of Athens. Preliminary 3D tomographic models indicate the presence of gross structures related with Pindus hinterland, the Tethys subduction beneath the Aegean, and shear zones related with the CTF and the Andravida fault. A predominant NE-SW oriented low velocity zone in central Peloponnesus is related with the rotation of the extensional stress field and dextral strike-slip faulting.