

Shear zones developed between extensional and compressional tectonic regimes: recent deformation of the Burdur Fethiye Shear Zone as a case study

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The southwestern Turkey is one of the most tectonically active areas of the eastern Mediterranean and therefore is a controversial region from the geodynamic point of view. This complex tectonic regime is dominated by the westward escape of Anatolia related to North Anatolian Fault, Aegean back-arc extension regime due to roll-back of Hellenic Arc, the subduction transform edge propagator (STEP) fault zone related to the motion of Hellenic and Cyprus arcs and compressional regime of Tauride Mountains. In addition to that, an active subduction and seamounts moving towards the north determine the tectonic frame of the Eastern Mediterranean. Many researchers suggest either the existence of a single left lateral fault or the nonexistence of a fault zone between Western Anatolia and Western Taurides. According to the integration of digital elevation data, non-commercial GoogleEarth satellite images and field studies, a 300 km-long 75-90 km-wide NE-SW-trending left lateral shear zone, the Burdur-Fethiye Shear Zone, is located among these tectonic structures. By using GPS velocities and focal mechanism solutions of earthquakes, it is understood that most of the previous studies turn a blind eye to the hundreds of faults related to a left-lateral shear zone which will have an important role in the Mediterranean tectonics. The Burdur-Fethiye Shear Zone is like a zipper driven by the relative velocity differences due to the Aegean back-arc extensional system and Western Taurides compressional region and presents a high seismic activity. The GPS vectors reflect remarkable velocity differences on land and relatedly the significant topographic differences can be clearly observed.

According to the GPS vectors, the Aegean region moves 4-12 mm/yr faster than the westward escape of the Anatolia towards southwest and the velocities are low in the Western Taurides. The left-lateral differential motion across the Burdur-Fethiye Shear Zone varies from 3-4 mm/yr in the north side to 8-10 mm/yr in the south. This data indicate that while the African Plate is subducting beneath the Western Anatolia at a rapid rate along the Hellenic Trench, the subduction is slow or locked beneath the Western Taurides. Consequently, the Burdur-Fethiye Shear Zone is an intracontinental transform zone between the extensional and compressional regimes and also propagation of the STEP fault zone into the upper plate. This study also shows how the deep structures like the continuation of the STEP fault between Hellenic and Cyprus arcs into the continental area can come into play as a shear zone on the brittle crust.